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Model Engineer

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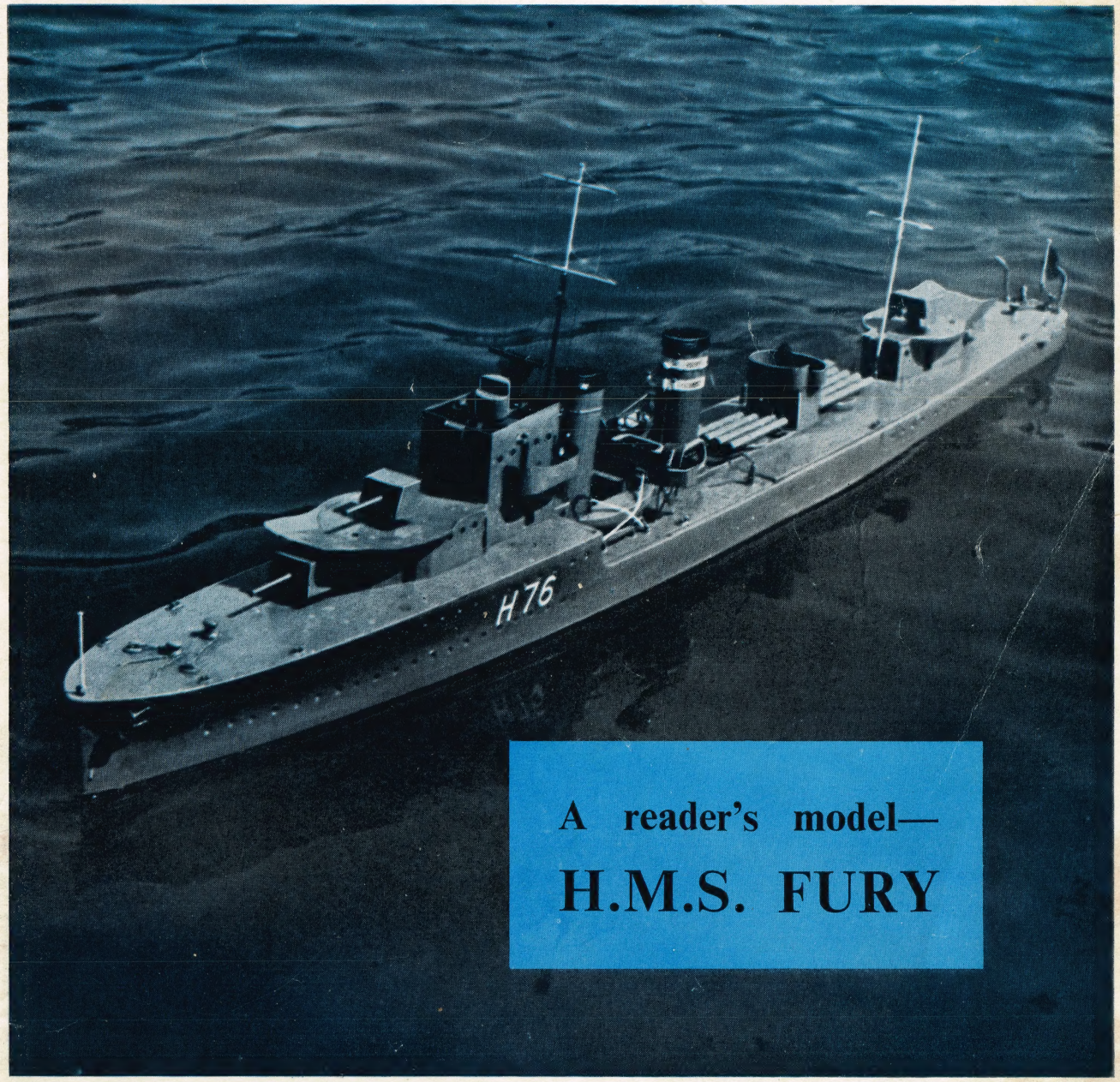

A reader's model—

H.M.S. FURY

ONE SHILLING 2 MAY 1957 VOL 116 NO 2919

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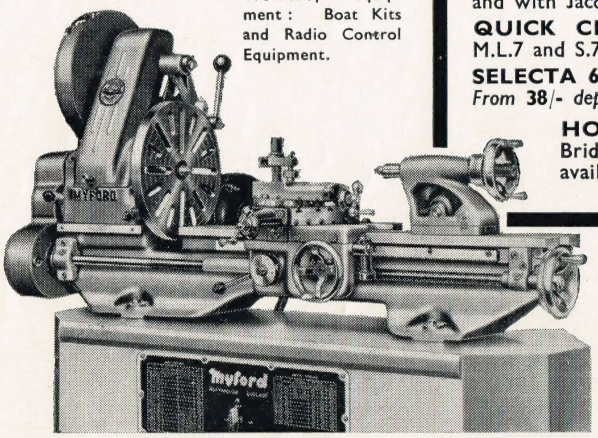

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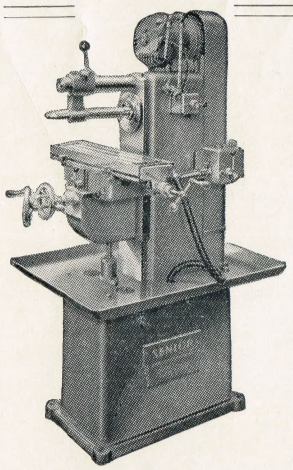

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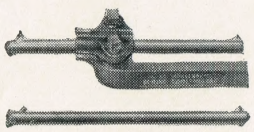

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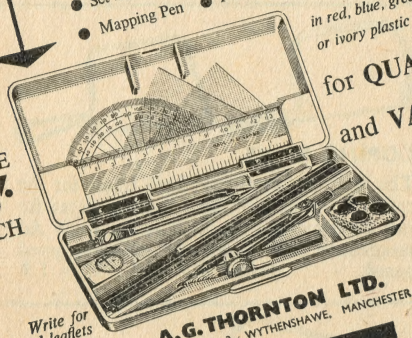

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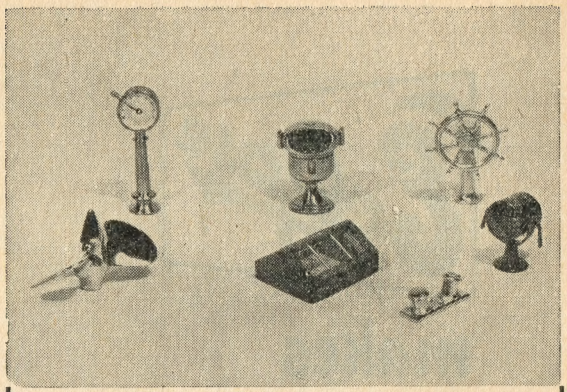

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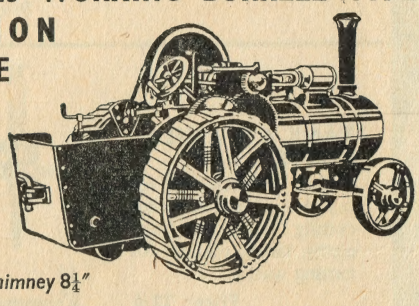

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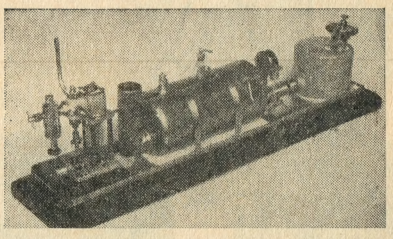

This plant is suitable for boats up to 48 in. long. The engine is $\frac{9}{16}$ in. bore, $\frac{1}{2}$ in. stroke and 4 in. overall height. Cylinder is cast-iron and fitted with circular slide valve.

The boiler is copper, brazed throughout, 2¾ in. diam., 5¾ in. long, and 8¼ in. overall length, fitted 1 in. centre flue with $\frac{3}{16}$ in. copper heating elements.

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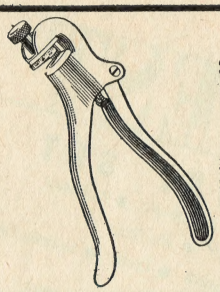

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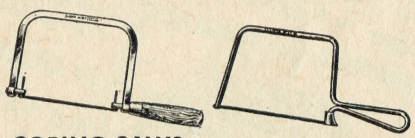

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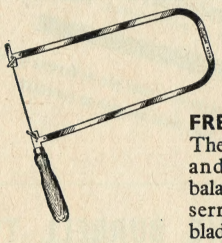

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Model Engineer

2 MAY 1957 VOLUME 116 No 2919

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NEXT WEEK

Unusual locos

Model 18-pounder: Second article on this fascinating modelling subject

Hermaphrodite wagon: A two-wheeled farm wagon that does duty as a four-wheeler at haymaking time

Ship modelling for beginners

Vosper patrol boat

All correspondence should be addressed to the Editor, Model Engineer, 19-20 Noel Street, London, W.1.

A WEEKLY COMMENTARY BY VULCAN

ALTHOUGH Alan Villiers was a regular contributor to *Ships and Ship Models* I do not think he sails model boats. In fact I am almost certain he doesn't. If he had done he might have seen what I saw one Sunday morning at the Round Pond, South Kensington.

There was a strong breeze blowing and the water was sufficiently rough to threaten the safety of the yachts and power boats sailing on it, but I noticed a tiny sloop, less than 12 in. long, sail right across. Admittedly she was slow, but at no time was she in difficulties. She was tossed about but she shipped no water. Instead she rode *over* the waves, rising to the crests and falling into the troughs, and all the time making headway. Apparently her sail plan was well balanced and not too large for the conditions.

What I saw that day helps me to understand Alan Villiers' confidence in *Mayflower II*. He has sailed many small ships over deep water and it is obvious he expects *Mayflower II* to cross the Atlantic in the same way that the little sloop crossed the Round Pond.

Way back, down under

I MUST thank reader J. Dunn in New South Wales (51 Bardwell Road, Bardwell Park, N.S.W.) for sending news of a locomotive that hibernates for half the year.

The *Sunlander* deserves her rest; she is 67 years old—four years senior to her driver, cheerful Frank Ford—and during her active season, from July to December, she zig-zags through the canefields of the Far North Coast, on the line between Cudgen and Chinderah, with 30,000 tons of cane for the barges plying upstream to Condong Mill.

She has small wheels, plenty of pipes, a stubby green boiler lined in red and black, and a huge diamond-shaped funnel to catch the sparks. Is it any wonder that live-steamers should travel up from Sydney to make her acquaintance?

Frank Ford is worth meeting, too. He can remember the wild rough days when the cedar-getters sailed the Brunswick in their schooners and rum was brewed on Harwood Island in the Clarence. Through all the changes, Frank has kept to the same schedule and the same speed—a steady 15 m.p.h. With steam at 160 lb., *Sunlander* curves her way serenely through the canefields at the head of 20 loaded wagons; and 20 loaded wagons weigh 100 tons.

2 ft Fowlers

Reader Dunn regards MODEL ENGINEER as the main instrument in advancing the model engineering movement to its present point. In 1951 he arrived in England as a sea-going engineer at just the right time for the exhibition. "I always look back at it," he writes, "with great pleasure."

Mr Dunn is now engineer at a

water pumping station where two Worthington pumps built in 1889 and 1891 are still pumping their 12 and eight million gallons a day.

When the family has properly settled in its new home Mr Dunn will probably begin on a Marshall portable engine at 1 in. scale or a Fowler 2 ft gauge locomotive in $\frac{3}{8}$ in.

"Fowler locomotives," he says, "are very numerous around the sugar mills in Queensland where I am told there is a total of about 1,000 miles of 2 ft gauge track. These little locomotives with their spark-arrester funnels were still being built up till about 1953."

Now, as on the main railways, small diesel engines are taking the place of the steam locomotives on the sugar tramways in Australia's cane country.

Engineer in embryo

WHEN Richard Gordon Conradi comes home from school at Oundle, the family home at Hatch End in Middlesex soon begins to show signs of his presence.

Richard is not much over 15 yet he can already claim to have been modelling for 11 years ! He began as soon as he could use a screwdriver. Three or four years ago his work entered the serious stage and he is now devoted to model engineering and to the construction of electrical devices.

Besides making a model of his home with electrical and water systems which operate realistically, he has let his ingenuity loose on the prototype and fitted every room with a loud-speaker telephone system.

May I assure his long-suffering sister, who may have Big Brother coming through at any hour of the night, that this is how the great model engineers are made ? Meanwhile Richard gets plenty of encouragement from his father, Mr Gordon Conradi, who is managing director of the British Central Electricity Company.

As a professional engineer, Mr Conradi understands the importance of stimulating a boy's inventiveness and skill.

'City of Truro' at work

THE revivification of the old G.W.R. engine *City of Truro* has caused a considerable stir. On March 30 she ran well on the Festiniog Railway Society's special between Wolverhampton and Ruabon, hauling a seven-coach train of about 255 tons gross and gaining time with it.

Since then, in order to keep the engine in good working trim, she has been stationed at Didcot for working light passenger trains between there and Newbury, arousing much interest in both places and along the route.

When the Stephenson Locomotive Society, Midland Area, announced that its excursion from Birmingham to Swindon on August 25 will be hauled by this historic engine so many applications for tickets were received that it will now be necessary to run at least three excursions.

The very fact of having a locomotive taken out of a museum and returned to stock for working special and even regular trains is an event that is unique in railway history. No wonder it has excited so many enthusiasts !

Cover picture

This model of H.M.S. FURY *was constructed by F. L. Davies, a prominent member of the Newcastle Society of Model Engineers.*

Now 20 years old, the ship is still in excellent condition. Her timbers are still sound, though she has completed 800 miles of steaming, wearing out two boilers in the process.

J.N.M. saw *City of Truro* at Newbury on April 20. He complains that the Indian red of the frames is too light, and the double lining on the cab is quite wrong. But he agrees that it is far better to have her like this than not at all.

The MAYFLOWER II *tied up at Brixham, Devon, in preparation for her 3,000 mile trip to Massachusetts*

Oil firing for model steamboats

R. H. MAPPLEBECK offers advice and provides constructional details for making a simple blowtorch unit for medium-size boilers in model boats

THERE is a certain amount of mystery surrounding oil firing in model boats. The newcomer to power boating is often faced with making a boiler-heating device about which he has heard many and varied opinions expressed but has some difficulty in placing a finger on any positive data.

It is true that home-made blow-lamp torches can be temperamental. Nevertheless it is quite a simple matter to "knock up" one that will give good results. Individual idiosyncracies in behaviour are easily ironed out provided the model engineer has followed out something approaching a commonsense design.

First, however, let's examine some of the fundamental requirements. These torches burn paraffin or petrol. Petrol rationing is not being considered in these notes as the information will apply generally when such rationing has ended.

The action of functioning follows out the well-known principle put into practice by Bunsen where a gas under pressure is ejected through a jet hole into a firing tube. It travels past vent holes where it picks up oxygen from the air and the mixture is then ignited.

Liquid fuels must be turned into a gaseous state before this operation can be carried out. That means they must be pre-heated to a point where vaporisation occurs. This is quite easily managed by pumping air into the fuel tank which, in turn, forces the fuel through a heating coil wound round the burning tube. The resultant gaseous fuel issues from the jet and is ready for ignition.

Many powerboat men favour petrol as a fuel in preference to paraffin. An advantage is that it is much more volatile than paraffin and, in consequence, requires a smaller heating coil. It is also considered safer in a boat—strange as that may seem—because if the flame should become extinguished while the craft is running, the fuel will continue to issue from the jet nozzle as a gas which can be easily relit.

Paraffin, on account of its low volatility, would cool almost immediately to a point where liquid fuel would be ejected. There might well be a pool of hot liquid fuel in the bilge which would immediately catch fire on re-ignition of the blowtorch. In the excitement of the moment at a regatta this can easily happen—and in fact, boats have been gutted because of this. A simple precaution then with paraffin is not to re-light the torch until it has been ensured that there is no loose fuel in the boat.

For the novice a point in favour of paraffin is that there is less risk of explosion through accidental mishandling, especially in the workshop. A lighted match may be plunged into paraffin at ordinary air temperatures and it will just go out. Not so petrol !

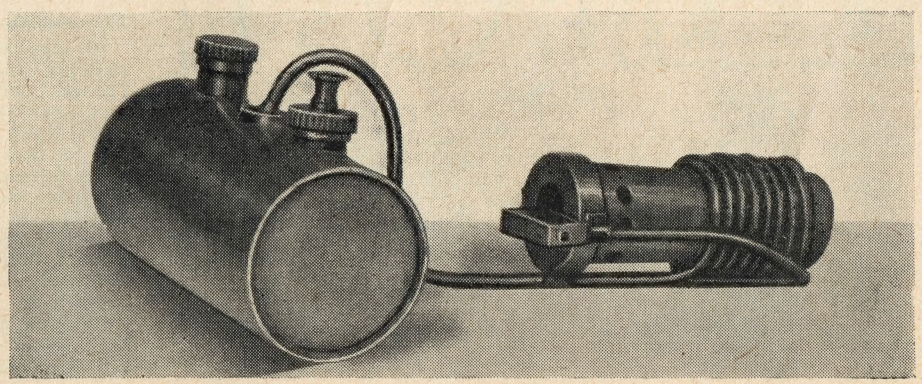
There is little to choose between the two fuels for heating quality. Both give a good hot flame, but the jet opening required for petrol is somewhat larger. What is important is to have adequate heating surface in the pre-heating coils, as paraffin needs more heat to vaporise it than petrol. Therefore, the first factor affecting design becomes apparent, namely the heating surface and, hence, the size of tubing and the number of coils.

In the blowtorch described here it was found that six to eight coils gave sufficient heating for paraffin as against three coils for petrol, using $\frac{3}{16}$ in. hard-drawn brass tube. Brass tubing is much better than copper for this purpose as it may reach a near red heat when in action and does not oxidise and flake like copper. (Flaking will soon cause blockage of the jet.)

Other items of importance are the jet size, the air vents and the burning tube. The dimensions of these can vary quite a bit, depending on requirements. But it seems to be the general opinion among blowtorch exponents that no two similar lamps ever function in quite the same way, individual treatment being required for maximum results.

This may be true in a very general way, but when one comes to consider it manufacturers have been turning out builder's blowlamps by the thousand to standard patterns for many years without the slightest trouble. The fact is that we powerboat men do not get together enough and standardise our results. Each man makes his blowtorch to his own ideas and gets it to work by experimentation.

Admittedly, the same procedure has been adopted with the one in these notes. But it works—and it is hoped that others will come forward with their data so that some means of standardisation for various-sized lamps will eventually result. The



The fuel tank and burner

Oil firing for model steamboats

one I am about to describe is a fair size as these things go; it is capable of steaming a boiler of about 1½ sq. ft heating surface evaporating about 2 oz. of water per minute.

Jet design important

Care in making the jet is important, as on this factor depends to some extent the manner in which the gas will be discharged into the burning tube. This, in turn, controls the manner of burning which, together with the fuel-tank pressure and actual jet size, determines the position of the flame in the tube. To obtain good ejection the jet should be made as shown, the jet-hole length being about three times its diameter. The feed hole to the jet should be large by comparison as indicated. The orifice is shaped venturi fashion.

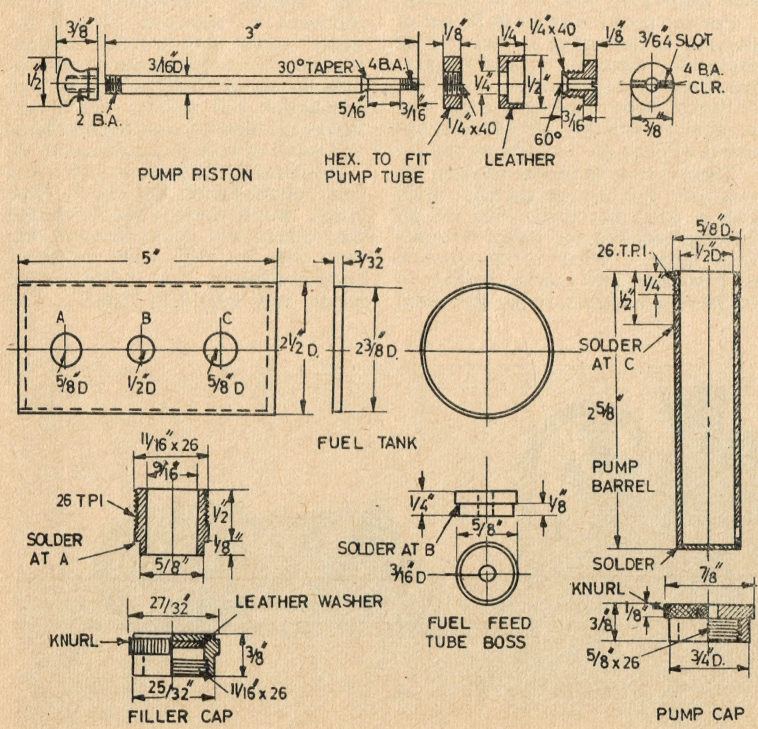
It is unlikely that the constructor will have a Slocomb drill suitable for use at the size required unless it be home-made, but good results can be obtained by using the point of the small blade of a penknife. Bad or uneven running is frequently traced to a faulty jet and may be due to a minute burr or roughness of finish on the venturi, or a particle of swarf in the orifice.

The firing tube

The firing tube is best made of thin brass tube. It must be realised that the end of the tube will be running at a dull red heat. Brass, as already mentioned, corrodes less readily than copper or iron and conducts the heat well into the heating coils, which are wound tightly round the flame tube. Some designs employ a flame tube with a completely open rear end and no side holes, others utilise all side holes and a closed rear. Good results have been obtained in this instance with a compromise, as can be seen from the illustrations.

Too much air causes a weak mixture with a too hot and very noisy flame. On the other hand a rich mixture, i.e., one with insufficient air inlet, will give a flame that is long, cool and smoky. The latter usually burns yellow whereas a hot flame is blue and nearly transparent. A too-hot flame tends to a purplish colour, with a tinge of green, sometimes due to overheating the brass at the end of the flame tube. If the flame tube is too thick it will not become hot enough to vaporise the fuel in the heating coils. It should be a dull red for about 1½ in. at the extremity.

Details of the tank and pump



It is not necessary, as in builder's blowlamps, to narrow down the orifice of the flame tube. A plain open end gives a slightly spreading flame, which is all to the good in a large firebox.

Fuel tank and pump

A large lamp needs a large tank. The only other alternative is to make use of an auxiliary tank, which is messy. If you want suddenly to remove the lamp during running, time will be wasted and fuel spilt in uncoupling. Much better, have a large tank attached directly to the lamp and keep the whole thing in one unit. For this reason a tank holding about ¾ pint of fuel has been employed.

The leather piston washer of the pump plunger may be made from boot-repair leather stock. Mill out a hole to a depth of three quarters of its thickness with the leather clamped on the faceplate. The washer may be cut out of the sheet by the normal method of cutting a disc from sheet material on the faceplate. When finished, it appears like that of a cycle-pump washer.

An alternative method is to mould a thin disc of leather about 1/16 in. thick and 1 in. dia. by forcing into a brass tube ½ in. dia. with a ⅜ in. rod. Heat it gently over a cool flame while clamped in this position to set the leather without damaging it, then remove and trim up. A little practice may be necessary to obtain the right amount of heat.

The piston assembly should be free on the plunger spindle with about 1/32 in. end play. This gives a quick air release for the upward stroke of the plunger similar to that found in a primus stove. On the downward stroke the taper portion makes a gas-tight seal and air is forced through the spring-tensioned ball valve into the tank. The tension of this phosphor-bronze spring is very light. When seating the ball, which if so desired may be made of stainless steel, give it a sharp tap to bed it down.

The assembly

All joints on the tank may be soft soldered, though silver solder is stronger. Joints on the burning tube must be silver soldered.

The pump valve must be soldered into its final position on the pump barrel before soldering the barrel into the tank; this must be done before soldering in the end plates. The latter have been slightly recessed into the tank so that a fillet of solder may be run round the edge to make a good strong joint.

First, the jet mounting block: drill the hole for the 4 B.A. thread, then drill the communicating hole from the

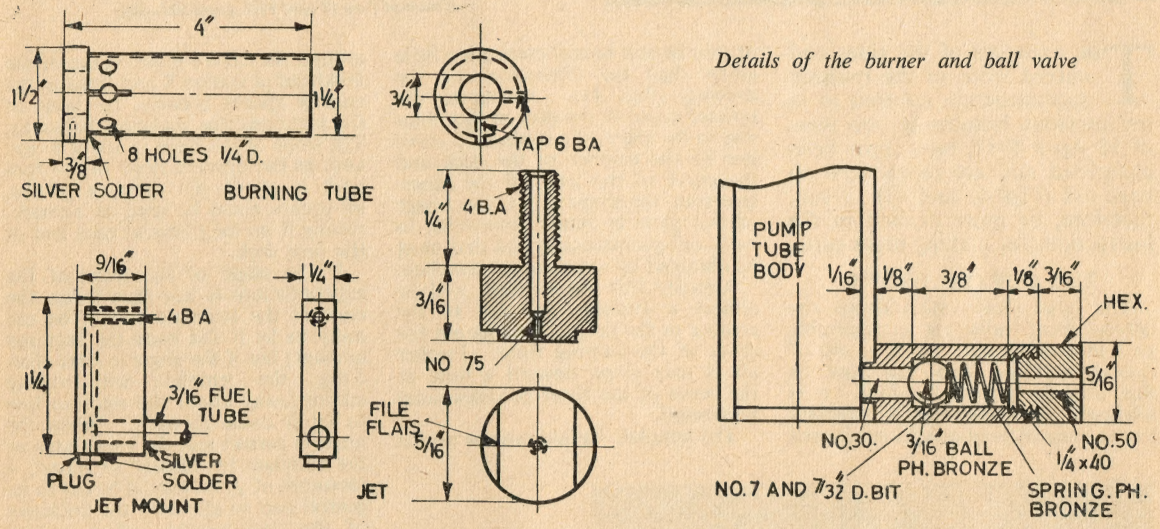
far-end face to break into this hole. Drill the $\frac{3}{16}$ in. hole for the inlet fuel pipe to break into the cummunicating hole. Tap the jet hole 4 B.A. Remove the swarf by washing in petrol (or similar liquid) and turn up a small plug with a flange to fit the communicating hole. Force this in and run silver solder over and round it at the same time as silver soldering the $\frac{3}{16}$ in. fuel pipe.

Place a washer made from soft copper foil over the threaded portion of the jet and screw home tightly, using the flats on the jet body.

The two small brass clips holding the fuel pipe to the flame tube body will keep the whole assembly rigid and no further support is needed. But don't forget to carry the fuel pipe right to the bottom of the tank and cut a V-notch in the end.

Lastly, a jet pricker is made by silver soldering a small length of fine steel wire about 0.012 in. to a piece of heavy gauge wire bent at right angles. It will be noticed from the drawing of the flame tube that a slot has been cut in the uppermost air-vent hole to allow access to the jet with this little tool.

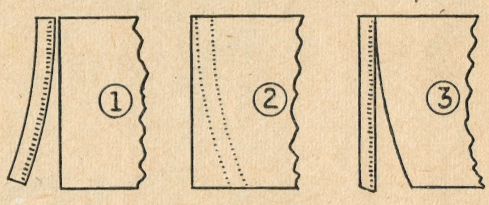
This lamp has been kept as simple as possible, but there is no reason why more ambitious constructors should not add a valve close to the jet to regulate the fuel supply, or a needle valve to the screw-on fuel cap to release pressure for extinguishing. At present, it is only necessary to loosen the filler cap for this function; hence the use of a leather washer to render it gas-tight. ▣



Details of the burner and ball valve

Cutting sheet metal

By John H. Ahern



FOLLOWING an article by Geometer on metal working it may interest readers to know that there is a method of cutting straight strips from a piece of sheet metal with shears or snips. Although not 100 per cent. efficient, it is nevertheless useful for many purposes.

As Geometer says, a narrow strip cut with shears from a straight edge of a metal sheet will assume a curve. So cut your strip on a curve—selected so that the initial curvature and the distortion cancel each other out, leaving you with a straight strip.

In the first place it is necessary to discover the correct degree of curvature for the particular sheet of metal and the width of the strip. Thus start by cutting a trial strip of the required width from a straight edge of the sheet. When this has been flattened out it will look something like diagram 1, and it will give you the curve upon which the actual work piece should be cut. The next job is to transfer this curve to the sheet (diagram 2).

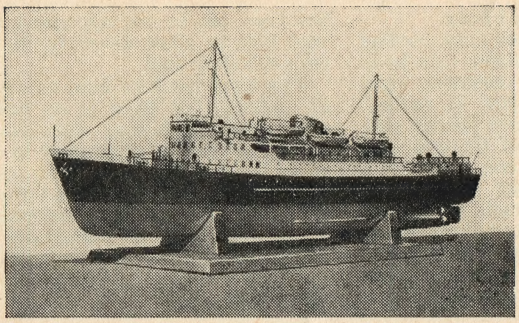
It is obvious that this can be done in several ways, as may best suit the worker's convenience. If the surface of the metal will take a pencil line, it may be sufficiently accurate for the purpose to use the curved strip as a template: hold or clamp it on the sheet and draw a pencil line around the edges. Alternatively, a scriber could be used, provided the strip was sufficiently firmly clamped in position.

But a more precise and workmanlike way would be to ascertain the radius of the curve and to transfer it to the metal with dividers or a trammel.

Whichever method is selected, the next step is to cut on the marked lines and the metal will distort as shown in diagram 3.

As I have said this trick cannot give completely accurate results, but if it is considered important to true up the edges this can be quickly accomplished by draw filing as it will not be necessary to remove much metal in order to produce a straight edge.

I must, however, add one word of caution. Most sheet metal has a fairly prounced grain and it is hardly likely that the same degree of distortion will be produced whichever direction the sheet is cut in. Therefore, do not cut the test piece from one edge of the sheet and the final work piece from another approximately at right angles to the first one. The result might be quite different, so it is safer to take both pieces from the same edge. ▣



A WORKING MODEL OF ST NINIAN

By EDWARD BOWNESS

The ninth article in this series deals with the initial stages in building the midship superstructure

(Continued from 18 April 1957, pages 580—582)

THE drawings of the sides and curved front of the midship superstructure referred to in my previous instalment [see issue of 18 April 1957] have now been completed and are reproduced on page 631 (Figs 41 and 42). I can, therefore, be more explicit in the instructions for making these parts.

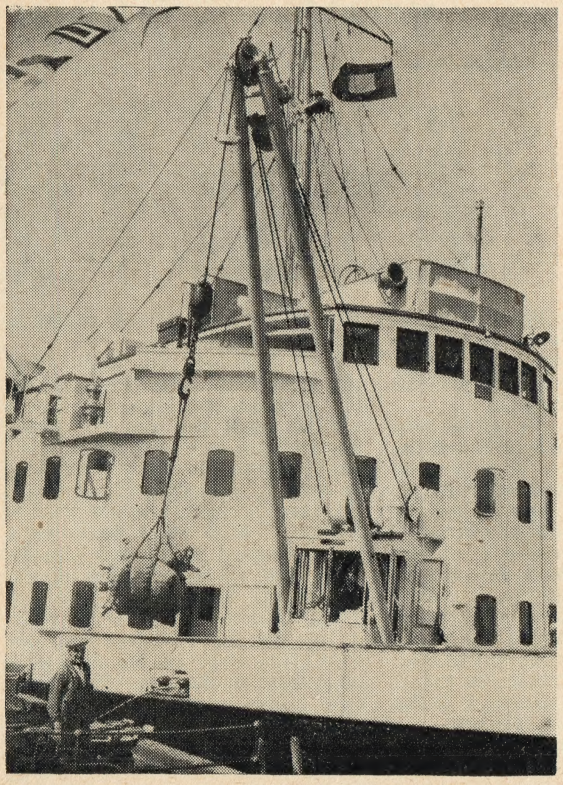
THE CURVED FRONT

The large plate which forms the curved front calls for considerable ca e in cutting out. It is made of tinplate 0.012 in. thick, the same as that used for plating the hull. It is advisable to make first a template from a piece of good-quality cardboard or thin Bristol board, cutting it a little larger than the dimensions on the drawing (Fig. 41). Owing to the upward curve of the deck at this point due to the sheer, the thwartship curve due to the camber of the deck and the curve of the front of the superstructure, the shape of the lower edge of this plate is almost impossible to work out geometrically and thus must be obtained by means of the template.

Actually this shape might well be almost a straight line due to the camber of the deck cancelling out the effect of the sloping front. Further aft it may slope upward a little as the curve of the sheer becomes more horizontal.

The template should now be carved around the curved plate on top of the bulkhead at station 8 and fitted in the narrow spaces between the ends of the plate and the midships bulwarks. The slope of the front is about 5 deg. and, as the upward slope of the fore deck is about the same, a 90 deg. set-square could be used as a check, resting it on the plates at each end of the fore deck.

If the angle of the front of the superstructure is less than 5 deg. the ends of the template should be cut away to let it fall back the required amount; but if the angle is more than 5 deg. the template will require cutting away about the midship line to let it come forward. When the angle is correct and the lower edge of the template fits closely all round, a clearance of $\frac{1}{16}$ in. should be cut in its central part to allow for the thickness of the deck planks, which extend around the curved front to the waterways on each side. These planks are butted against the curved strip on the bulkhead, (Fig. 23) and the superstructure rests on them.

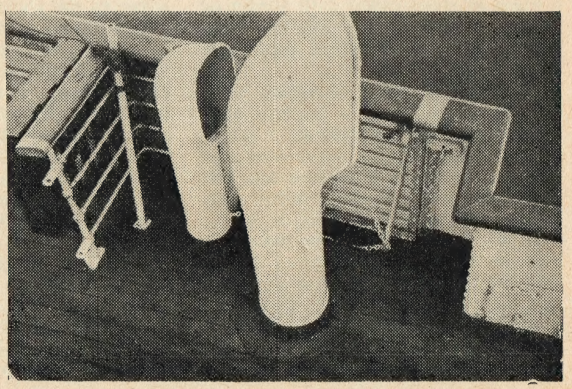


Left: Curved front of the superstructure and bridge [*Herbert Morris Ltd, Loughborough*]

Below: Port wing of the bridge showing corner of the sidelight platform

PLANNING THE WINDOWS

The top and bottom lines of the windows for each deck may now be marked on the template and the windows and doors drawn as shown in Fig. 41. Note that the deck lines and all the horizontal lines are parallel with the base of the template and that



all heights must be measured from this wherever they occur. It will be seen that the windows are rounded along their upper and lower edges as well as in the corners. The sides of the doors and windows are, of course, vertical—and this entails some care in marking out.

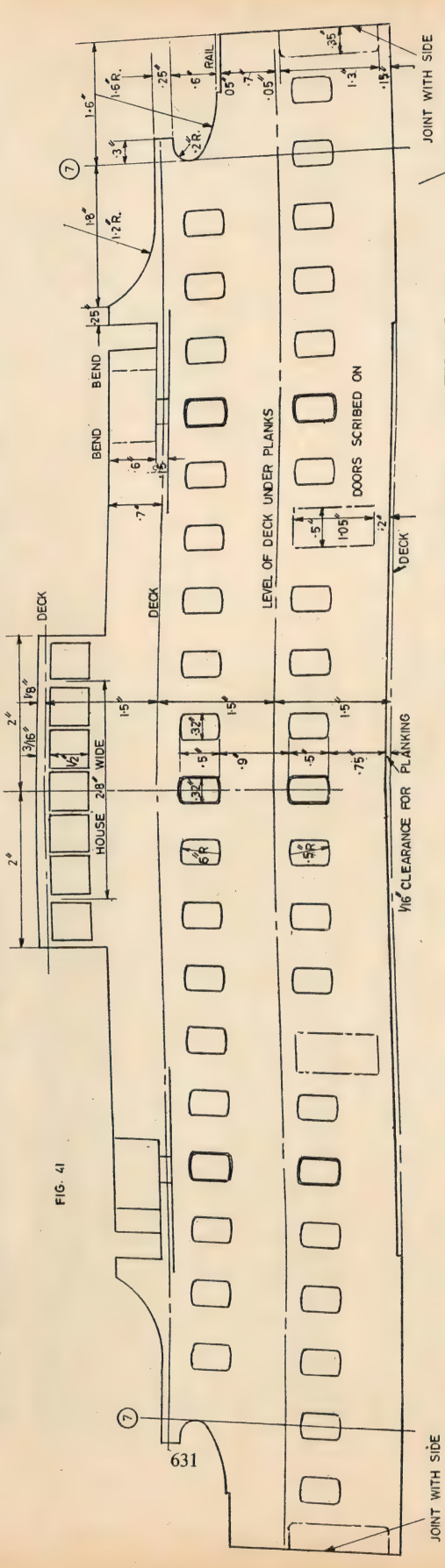
With the template in position on the hull draw a vertical line on the centre line of the vessel. Next note the position of station 7 on each side and draw a vertical line on the template through these points. The ends of the template where the curved plate joins the side plates are on the centre line of the passengers' gangway doors, which are 8 ft (or, on the model, 1.6 in.) aft of station 7. These are shown in Fig. 41, the original of which is drawn full size for the model and is included in the drawings of the ship published by the Percival Marshall Plans Service.

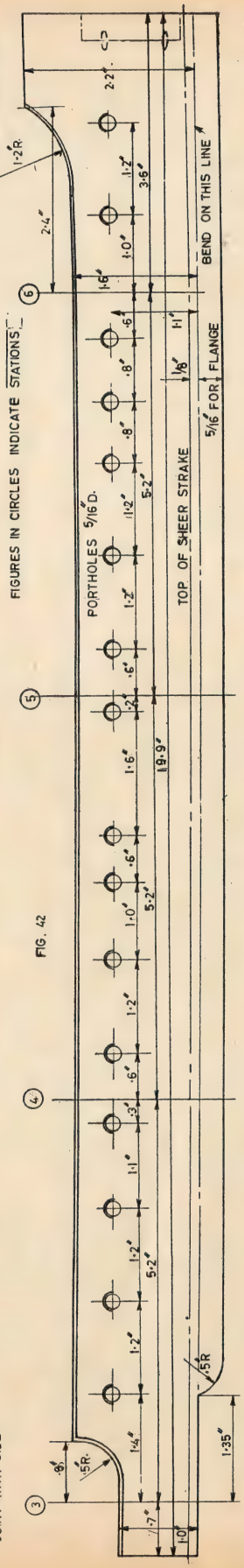
On the drawing the lines at station 7 and at the ends of the template slope inwards. This will be the case on the template, and is due to the sloping front. Viewed from the side the foremost windows appear to slope aft, but nearer the sides of the ship they appear vertical, which, in fact, they are. The drawing is only approximate and the actual slope, which varies from window to window, must be indicated on the template while it is in position on the model.

The windows on the promenade deck level are spaced equally and the lower windows are in line below them. Six of the windows are made to open and have separate frames with outside hinges as indicated by the double line on the drawing. A wire or a flat strip could be soldered around these windows to indicate this. The outline of the remainder of the template can, after it has been removed from the hull, be drawn with the template flat. The dimensions are given in Fig. 41.

THE BRIDGE WINGS AND SIDE-LIGHT PLATFORMS

The wings of the bridge, in combination with the platforms for the side lights, are an interesting feature of *St Ninian*. The wings are formed by reverse curves on each side of the curved front brought out to meet the sides of the superstructure, which are carried forward to form a corner. A slice is cut out of the corner to house the side lights (Fig. 43). To make this the upper edge of the plate has a space cut out 0.6 in. deep by $\frac{6}{16}$ in. wide and $\frac{1}{4}$ in. forward of the





Right, Fig. 41: *Template for the curved front of the midship superstructure*

Extreme right, Fig. 42: *The side plates for the midship superstructure*

curve of the hance from the boatdeck. A sawcut is made from the bottom of this space and parallel with the upper edge. This is bent as shown in Fig. 44 to form the side and end of the lamp platform.

Below the sawcut a rectangular space $\frac{5}{16}$ in. long × 0.15 in. deep is cut out, and from the bottom of this space sawcuts are made parallel with the deck line and the rail extending $1\frac{3}{16}$ in. fore and aft. Two L-shaped plates are cut out and soldered, one on each side of the bridge, in the position shown in Fig. 44, leaving a space $\frac{1}{2}$ in. wide for the hinged docking platform which is to be found at each end of the bridge. The forward end of the L-plate meets the small projection on the front of the bridge, to which it should be soldered.

Next the end of the upper part, which forms the end of the lamp platform, should be soldered to the corresponding edge of the L-plate and a four-sided piece to form the floor of the lamp platform should also be soldered in position, with a three-sided piece fitted underneath (Fig. 45).

For convenience in assembly the three-sided piece can extend $\frac{1}{8}$ in. or so inside the curved front (see dotted line in Fig. 45) and rest on the edge of the plate while it is being soldered. This will be covered later by the boatdeck which extends forward to form the wheelhouse and bridge floor. The picture of the bridge front clearly shows these features.

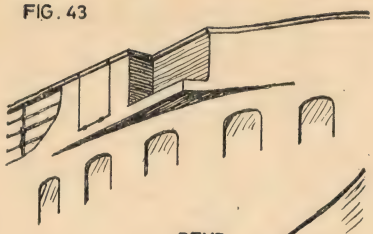
The upper edge of the bridge front will later be covered by a teak rail, of which more later. In the meantime the small close-up picture of this corner as seen from above will be helpful. The hinged docking platform already mentioned will be noticed, folded up in sailing position.

The two doors on the front of the superstructure can be scribed on, or, for greater realism, rectangles of tinplate can be soldered on with some suggestion of hinges and fastenings (Fig. 41). One of them may be seen open in the picture, as can also four of the six framed windows. (In a working model it is inadvisable to show doors open at this level in case water gets in.)

THE SIDE PIECES

The next job is to make the two side pieces. These are shown in Fig. 42, that for the starboard side being made as in the drawing and the one for the port side to the opposite hand. The lengths should be checked from the model. At the forward ends they must line up perfectly with the edge of the curved front; this is to facilitate making a joint as nearly invisible as possible. The after ends

FIG. 43



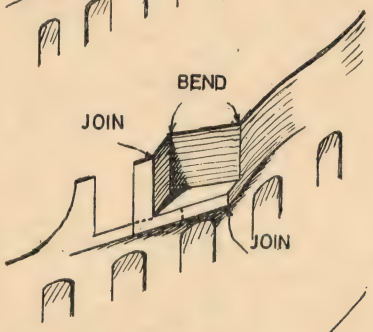


FIG. 44

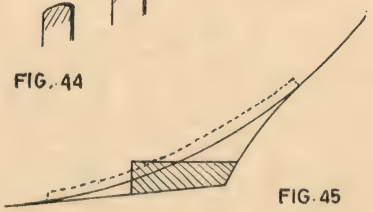


FIG. 45

Top, Fig. 43: Starboard wing of the bridge, with sidelight from below; centre, Fig. 44: Construction of the sidelight platform; bottom, Fig. 45: showing pieces for sidelight platform

should be left a shade long and trimmed level with the side bulwarks at a later stage.

There is an allowance for flanging on the lower edge, as mentioned in the previous instalment. This flange is not continued on the curved plate as it would only complicate the work. A wire should be soldered along the upper edge on the outside to form a beading. A similar beading is required on the edge of the side bulwarks (Fig. 16). This is interrupted where the bulwark is cut away for the hinged doors for the passenger gangways, but is continued forward of the doors until it lines up with the teak rail which is carried forward to the bows.

The position of the portholes is given on the drawing (Fig. 42). These should be drilled $\frac{5}{16}$ in. dia. and glazed on the inside with Perspex or similar material secured with adhesive. There is a shallow rigole on the upper side of all the portholes in the superstructure, but as they are not very noticeable in the actual ship they may be omitted if so desired. There is no outside ring on any of the portholes.

A butt strap $\frac{1}{4}$ in. or $\frac{3}{8}$ in. wide should be soldered behind the joint between the curved front and the side pieces, extending the full depth of the plates. The hinged doors which are 1.3 in. deep × 0.7 in. wide should be cut out and soldered on the outside of the plates, where they will help to strengthen the joints. They are almost invisible when closed except for the two hinges which are on the after edge. The thin tinplate if soldered down neatly all round will give the correct impression. The hingeplates should be soldered in the position shown in Fig. 41; the fastening is invisible from the outside.

FITTING THE AFTER BULKHEAD

Having prepared the two sides and the curved front, the after bulkhead (Fig. 39) should now be completed and tested for fit with the sides and front in position on the hull. Its length must be such that the sides fit tightly between the bulwarks. When all is satisfactory it should be soldered in position, with its lower corners a good fit with the flange on the side pieces. Incidentally, in Fig. 28 the upright locating flange is shown extended to the sides over the $\frac{1}{4}$ in. × $\frac{5}{16}$ in. angles inside the hull. It should have been cut off just short of these angles to clear the flange on the lower edge of the side pieces.

The three cross-beams under the promenade decks (Fig. 40) should next be tested for length, with the sides of the superstructure in position on the hull and, when all is satisfactory, soldered in the positions indicated on the plan of the promenade deck (Fig. 38).

THE PROMENADE DECK

The shape for cutting out the promenade deck is shown in Fig. 38. Aft, it is flush with the projecting portion of the after bulkhead on the shelter deck and on each side it overhangs this bulkhead by about $\frac{1}{2}$ in. The sides and front fit closely on the inside of the plates already erected. On the inside of the curved front it is supported by two angles soldered on at each side about $1\frac{1}{2}$ in. from the centre line of the ship. These can be made of tinplate approximately $\frac{1}{2}$ in. × $\frac{1}{4}$ in. bent through 85 deg. or so to suit the slope of the deck in relation to the sloping front. They should be $1\frac{1}{2}$ in. above the deck plate on which the front rests.

The deck itself is cut away in the centre for a length of 22.6 in. and a width of 4.5 in. for lightness and to give air space around the power plant. The deck should now be tinned along the edges on the underside, where it makes contact with the three supporting beams, and the after bulkhead. It should then be soldered carefully in position, making good contact everywhere especially on the underside where it meets the vertical plates.

● *To be continued*

Constructing sliding tools

★

By GEOMETER

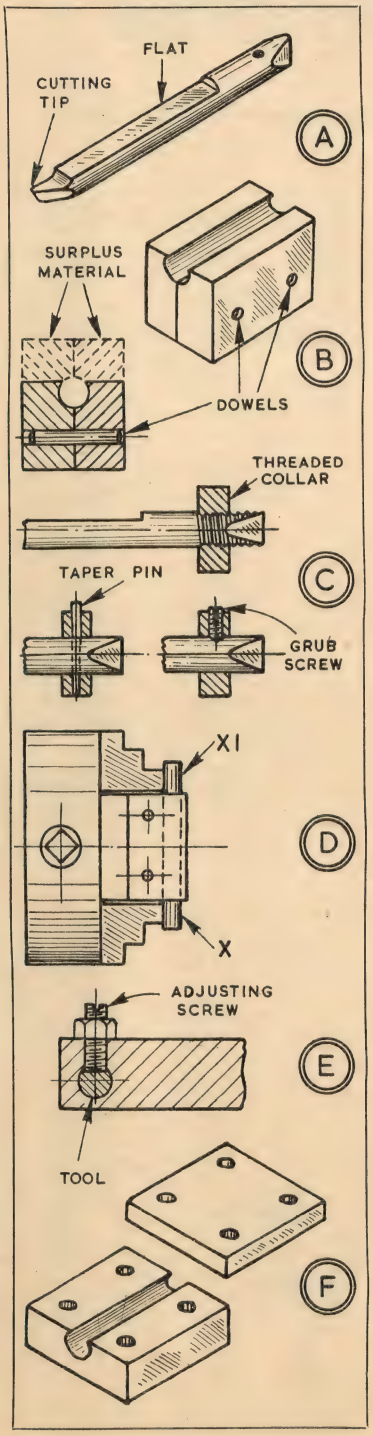
★

AS DESCRIBED in the previous article, certain kinds of simple form-turning are best accomplished by means of single-point sliding tools passing over the contours of form plates or form bars which control the movement of the tools for the cutting tips to machine the work to closely-resembling or exactly-similar profiles.

Providing the changes of contour are not too abrupt, and high precision is not essential, this method ensures a clean normally-machined surface, free from chatter, and requiring the minimum of smoothing and polishing with glass paper if the material is wood, and with emerycloth if it is metal.

A major condition, of course, with a sliding tool is that, while it moves freely endwise, it must not tip over or deflect unduly; and if the tool is of round material, as it can well be for amateur use, when of silver steel, it naturally follows some means of radial location is essential. This, as shown at *A*, where is depicted a typical small sliding tool, can be a flat extending far enough to permit the tool the necessary movement in its holder.

Depending on the type of holder, the flat on the tool can engage a flat-ended screw, or a flat plate when the holder is in two parts; or again, a special washer with a D-hole for the tool to slide through can be attached to the front of the holder. The tendency for the tool to overturn when cutting can be kept to a minimum by maintaining the cutting tip central, similar to an ordinary turning tool with a small radius—and it should also have top rake and side clearance. At the opposite end, the tool should be squared, then chamfered equally from each side, and the corners removed to leave a small radius.



The flat on the tool is produced by filing, and a check kept on its parallelism by calipers, or a micrometer for preference. Alternatively, a small jig of the type shown at *B* can be used, which is advisable when several tools are required, or they have to be replaced quickly.

Such a jig is made by dowelling two pieces of flat material, drilling and reaming on the centre line, then machining away the surplus material so that a piece of round stock gripped in the jig can be filed down to the surface and provided with a uniform flat. The jig material can be hardened and tempered if it is cast steel, or casehardened if it is mild steel.

The final feature essential for a sliding tool is means for attaching a collar to take the thrust of the spring maintaining the rear end in contact with the form plate or bar. Choice in this rests between a collar which is threaded, one drilled for a taper pin, or one provided with a grub screw, as at *C*—the tool in each case corresponding, then being hardened and tempered.

When a jig, as at *B*, is used in filing flats on tools, its accuracy must essentially be beyond question, and can only be ensured by a machining process—of which *D* shows the principle of the set-up in a four-jaw independent chuck.

The two blocks, finished except for facing off the surplus material, are held in the chuck with a bar through the bore, this bar locating back to two of the jaws, while the blocks are secured, then being pushed out. Assuming the jaws to be true, the blocks will be faced off squarely; but if the jaws cannot be relied upon, the bar should stand slightly away from them, and be tested to run truly at points, *X*-*X*1, as the blocks are tightened.

At *E* is shown how a simple tool holder can be furnished with a flat-ended adjusting screw to locate the tool and allow it to slide, while at *F* appears the body and top plate of a two-part holder for bolting together—with shims interposed if necessary. ■

Practical know-how in simple terms and with good illustrations—*Workshop Hints and Tips*, by Geometer, Percival Marshall and Co. Ltd, price 3s. 6d. (postage 3d.) U.S. and Canada $1.00.

The MUNCASTER steam-engine models—By Edgar T. Westbury

6—In this article the simple and compound twin engines are dealt with

(Continued from 18 April, pages 555 to 557)

THE term "simple" as generally applied to steam-engines does not denote simplicity in the mechanical sense, but may be more fully defined as "simple expansion," or, in other words, the use of available steam pressure range in one stage. This does not necessarily mean a single cylinder; such engines may have any number of cylinders, but each of them is fed with live steam at full pressure, and they each exhaust directly to atmosphere or into a condensing system. All the engines so far described in this series come within this definition.

At a very early stage in the development of the steam-engine—in fact almost as soon as any very substantial steam pressures above that of the atmosphere began to be used—it was found that in order to extract the maximum mechanical power from high pressure steam and avoid the rejection of exhaust steam while it still contained useful energy, a greater range of expansion than could conveniently be obtained in a single cylinder was necessary.

Even with valve gears designed to give very short cut-off, the pressure at the end of the piston stroke was undesirably high, and the logical development, therefore, was to transfer this steam to a second cylinder where a further stage of expansion was carried out before the steam was finally rejected. The best-known pioneers in this were Woolf and Hornblower, who succeeded in improving the economy of steam-engines considerably by this means.

In the further development of the "compound" engine, as it was called, further stages of expansion were added, producing "triple-expansion" and "quadruple-expansion" engines which became popular in very high powers, though the practical advantages of the fourth expansion stage have always been in dispute.

It will be clear that as the pressure of the steam is lowered at each stage, its volume is correspondingly increased (remember Boyle's law—PV equals a constant?) and, therefore, the sizes of the cylinders have to be progressively enlarged by a ratio determined by the pressure drop in each stage; it is, of course, desirable in a multi-cylinder engine that each cylinder should contribute a fairly equal amount of power at the driving shaft. For this reason, compound or stage-expansion engines are designed for a definite pressure range and produce their best results when input pressure is kept fairly constant.

I have made this lengthy—but, I hope, lucid—explanation because I have received a good deal of correspondence on engines of more than one cylinder lately, and there has been some confusion as to what constitutes a compound engine and its practical advantages in particular cases. Several readers, including some from remote parts of the world, have asked my advice on the respective merits of simple and compound engines for driving prototype model power boats.

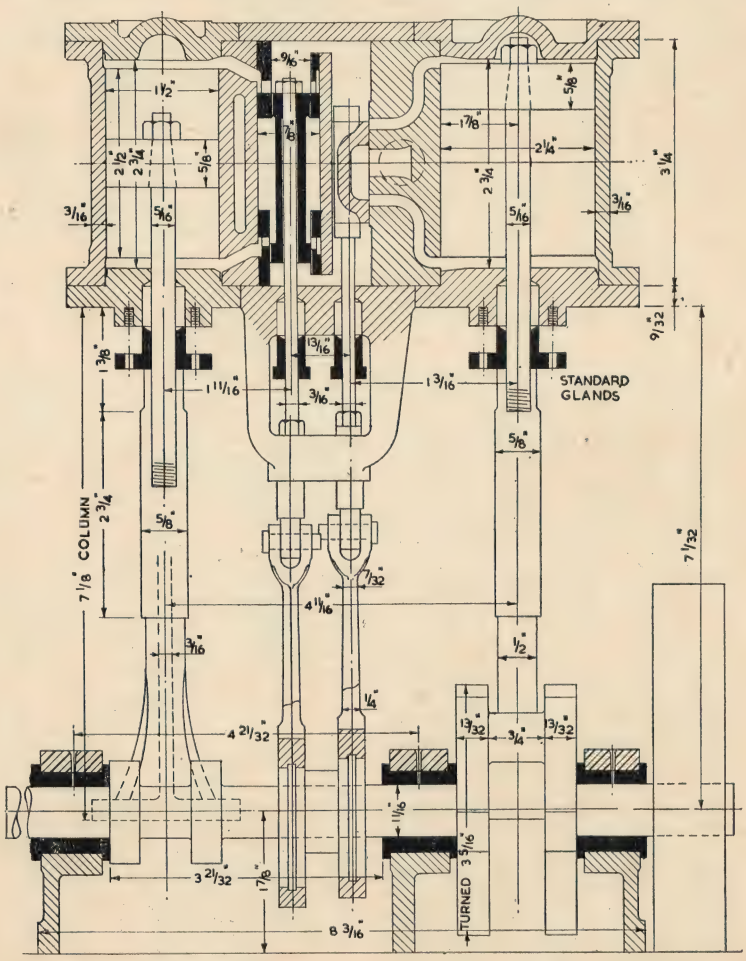
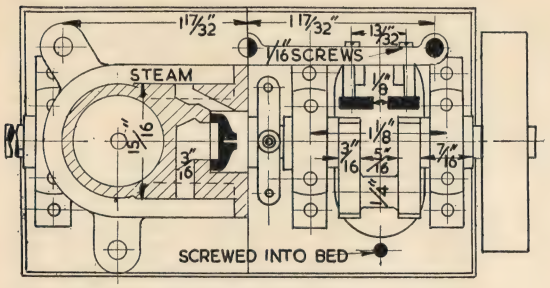
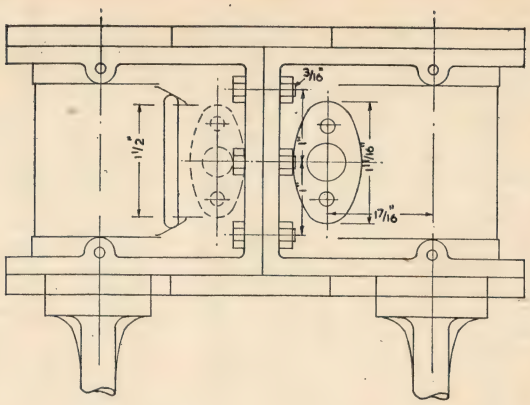
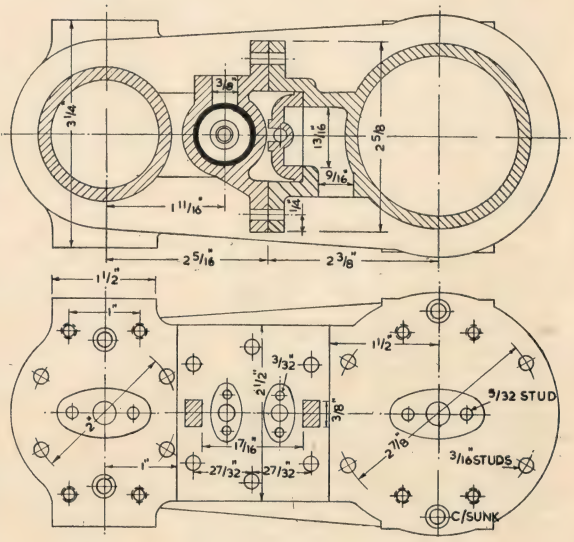


Fig. 31: Twin-cylinder compound engine with h.p. piston valve and l.p. slide-valve







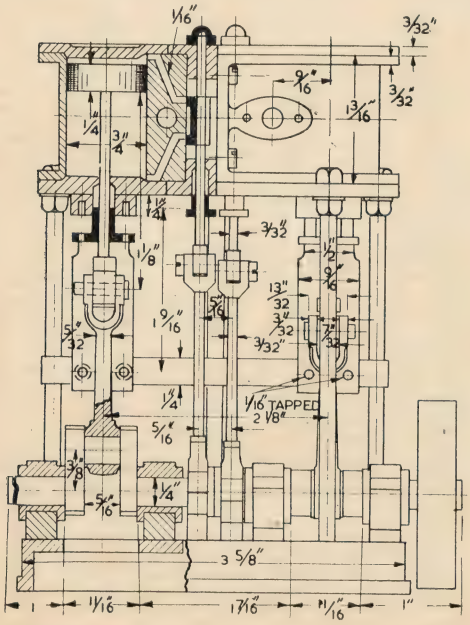
This is not an easy question to answer in definite terms, as so much depends on circumstances, not the least important of which are the conservation of heat and the reduction of pressure at the final exhaust outlet.

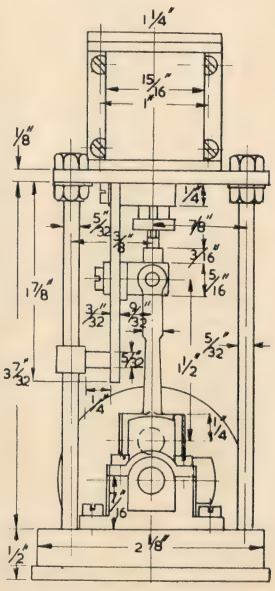
In small engines generally it is very difficult to avoid heat loss, as the "scale" conductivity of the metal is high and the effectiveness of heat insulation, which can be obtained by lagging, is low. Some heat loss is almost inevitably incurred in the transfer of steam from one cylinder to the next by way of an "eduction pipe" as it is termed. Incomplete elimination of back pressure is common, even if a condenser is fitted, as it is extremely difficult to produce a high vacuum such as can be obtained in large steam plants. Incidentally, it may be mentioned that the latter factor has an important bearing on the difficulty of exploiting the potential advantages of the steam turbine in small sizes, though large multi-stage turbines have a great advantage over reciprocating engines, because they enable progressive expansion from h.p. end to exhaust outlet (without transfer pipe losses) to be obtained.

Above, Fig. 30: *Plan view of the twin simple engine*

Right, Fig. 32: (*Top*) *cylinder elevation* (*compound engine*); (*centre*) *sectional plan of cylinder block*; (*lower*) *underside plan of cylinder block*

Below, Fig. 29: *A twin-cylinder simple engine with central slide-valves*





The fact that locomotive engineers, in this country at least, have never adopted compound engines to any great extent suggests that their advantages, where exhaust is released to atmosphere, are somewhat dubious; much the same applies to traction engines, though some of the compound types have earned a good reputation for efficiency. In marine and stationary practice, however, where surface and jet condensers capable of producing high vacuum are invariably used, there is no question about their superiority.

Whether small-scale engines of any type, working on pressures up to about 100 lb. and little or no exhaust vacuum, can employ compounding without the l.p. cylinder becoming merely a passenger, remains to be proved. In the case of a twin double-acting engine, the compound type is not *positively* self-starting unless fitted with a "simpling valve" for temporary admission of live steam to the

l.p. cylinder, and this may be an important practical consideration in many cases.

The engine illustrated in Fig. 29 is of a type well suited to model marine work, and its size would be suitable for fairly powerful prototype boats such as tugs, pinnaces or fast packet liners up to 6 ft or more in length. Its structure is of a type not at all uncommon in light marine practice; I have worked on engines similarly constructed (but of the compound type) in naval picket boats, though total enclosure of these engines was becoming more common at the time. No cast columns are employed, the cylinders being supported by five vertical turned steel pillars—two at the front and three at the back (see plan view, Fig. 30). The latter were used for the attachment of a horizontal member, which supports the lower end of the slide bars, and their top ends were secured to flat faces on the back of the cylinder gland bosses.

Demands accurate work

This form of assembly calls for careful location of the pillars, both at the bedplate end and in the cylinder base flange. It also calls for accurate lining up of the slide bars, so that they are exactly parallel with the cylinder axis, both crosswise and sideways.

A rather unusual form of cylinder casting is employed, having a channel-shaped steam chest, open at the two ends, the pair of castings being bolted together at the centre by four screws or bolts in a vertical flange. This gives better accessibility to the port faces than the use of a single cylinder block, while on the other hand it is simpler and more rigid than the common arrangement which uses separate steam chests—generally on the outside instead of between the cylinder.

The cylinders have separate spigoted covers top and bottom, and the ends of the steam chests are closed by single rectangular covers, the lower of which embodies the stuffing-boxes for both valve rods; the upper is fitted with guides for their " tail " ends.

While this is by no means a difficult form of construction, it demands special treatment, with due care in machining and assembly to ensure success. The two cylinder castings should be bored and faced separately, the length over outside of flanges being made as near exactly the same as possible. Next the vertical joint faces should be machined, either by facing on an angle-plate in the lathe or by milling or shaping. In the latter case, the port face may be machined at the same setting, thus ensuring that it is parallel with the joint face. But whatever method is employed, these surfaces should all be parallel to the cylinder axis.

Lapping of the port face is not as easy as for more conventional types of cylinders, as only a narrow lap, with rectilinear motion, can be operated in the space. But the major error liable to occur is slight convexity of the surface, which is a fault in the right direction. The ports and passages may be dealt with in the usual way, and are just as accessible as in other types of cylinders.

After bolting the two cylinders together, the end faces should be checked to ensure that they coincide to form an exactly flat continuous surface—any slight discrepancy being corrected by lapping. More drastic treatment by machining may be called for if there is greater difference of level.

This engine is shown fitted with single eccentrics for the individual slide valves; reversing may be obtained by using slip eccentrics, but for positive reverse control, link motion with double eccentrics may be fitted; this may call for a slight increase in the space between the centre main bearings. As the bearing surface is ample, no harm would be done by reducing their width slightly, and also reducing the width of the eccentric straps and sheaves.

A twin compound vertical engine

This is of the symmetrical double cast column or " steam hammer " type, as shown in Fig. 31, but apart from this feature several of the constructional details are similar to those of the previous design. The cylinder block is again divided vertically in the centre, with a bolted flange joint, but, of course, is unsymmetrical as the left-hand (h.p.) cylinder is smaller than the right-hand (l.p.) cylinder, in the ratio of 2 to 3, in bore diameter. This engine is practically twice the size of the simple engine as dimensioned in the drawings, but could quite easily be reduced to the same size.

● *Continued on page 656*

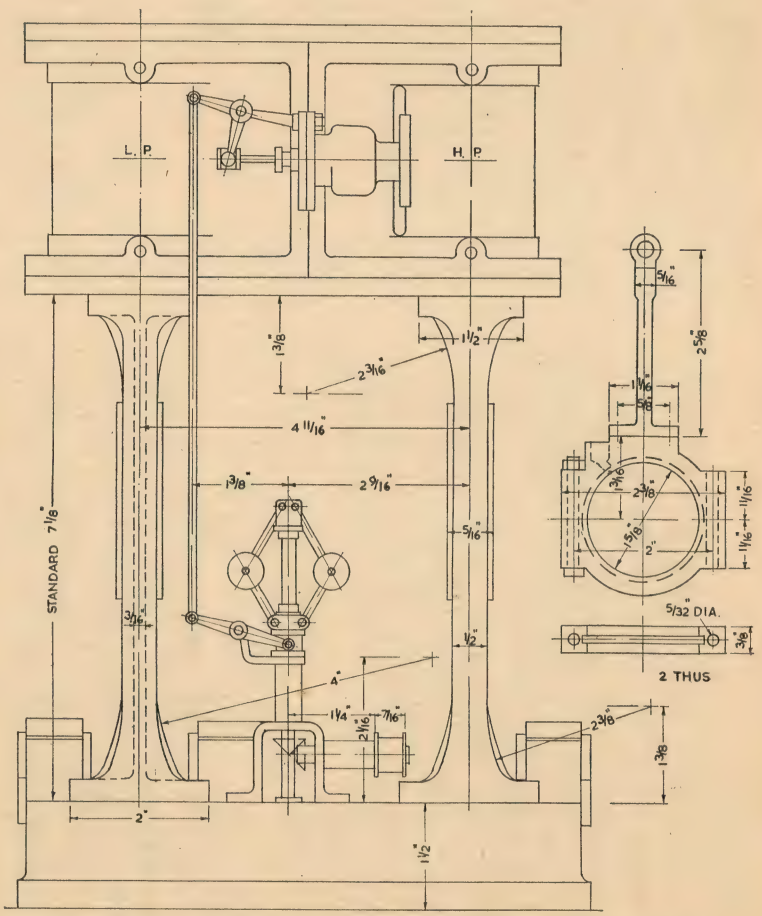


Fig. 33: *Rear view of compound engine, and details of eccentric straps*

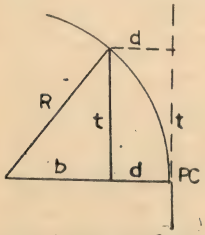
Curve location by the use of tangent offsets

By A. D. Slater

THE scale-railroad locating engineer encounters obstacles to projecting the alignment of his miniature layout as surely as does his brother on prototype systems.

It is doubtful if many live-steamers have a transit and even if they do it might prove of little aid in the confined locality that limits their operations. Also, it is possible that obstacles near the projected right-of-way may prevent a curve from being described with a tape or string (compass fashion). Under such circumstances the situation may be met by laying out the curve by the tangent offset method, sometimes used by railroad engineers when circumstances require, and the centre-line of the track can be prolonged beyond the beginning of the curve.

With these limitations in mind the following table was prepared in the hope that it might prove helpful to amateur track layers; a typical example of the manner in which the table was prepared is presented to enable the scale-railroad civil engineer to compute for himself the location of any point on a curve of any radius. It is the centre-line of a track that is staked.



For example, given a 90 ft radius curve what is the tangent offset for station 50, that is, 50 ft beyond point of curve (P.C.)? The formula is:

$$R^2 = b^2 + t^2$$
$$b^2 = R^2 - t^2$$
$$b = \sqrt{R - t}$$

Also $d = R - b$

where t = distance along projected tangent from P.C. and d = distance from tangent (measured at right angles) to point on curve.

In extracting square roots of numbers greater than 1,000, which are not available in ordinary tables of squares, the extraction may be done by looking up the log of the number, dividing by 2 and looking up the anti-log, which is the square root, which is then subtracted from the radius.

This is how it works. Substituting in formula $b = \sqrt{R^2 - t^2}$ we get

$$b = \sqrt{90^2 - 50^2}$$
$$= \sqrt{8100 - 2500}$$
$$= \sqrt{5600}$$
$$\log 5600 = 3.74819 = \log b^2$$
$$3.74819 = 1.87409 = \log b$$
$$\text{anti log } 1.87409 = 74.832 = b$$
$$d = R - b$$
$$= 90 - 74.832$$
$$= 15.168$$

Extraction of the square root by slide-rule should be precise enough for work with scale models. ▣

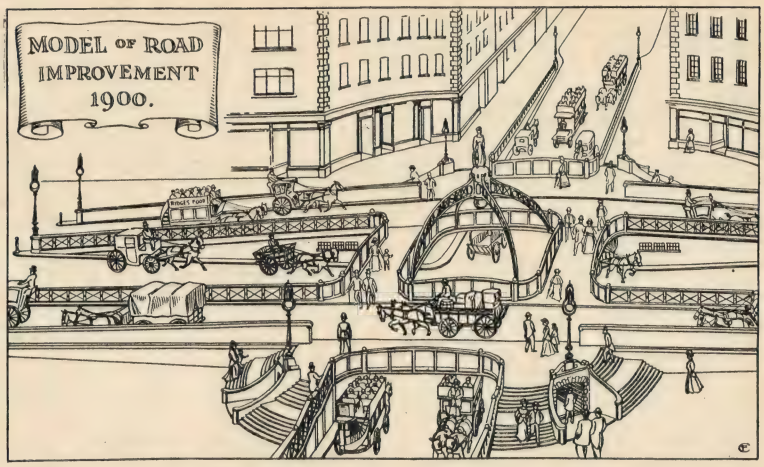
DISTANCE IN FEET ALONG TANGENT FROM P.C.

RIGHT ANGLE OFFSETS AT 5 FT INTERVALS (MEASURED FROM P.C.) ALONG A PROJECTED LINE THAT IS TANGENT TO CURVE AT POINT OF CURVATURE (P.C.)

Radius in feet	OFFSETS →																				
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
25	0.505	2.088	4.999	10.003	25															
30	0.420	1.715	4.019	7.642	12.972	30														
35	0.369	1.459	3.379	6.277	10.505	16.974	35													
40	0.314	1.271	2.917	5.359	8.776	13.539	20.638	40												
45	0.279	1.124	2.572	4.687	7.584	11.462	16.711	24.384	45											
50	0.250	1.010	2.301	4.176	6.699	9.999	14.297	20.003	28.213	50										
55	0.228	0.918	2.085	3.766	6.011	8.902	12.574	17.252	23.377	32.087	55									
60	0.209	0.840	1.906	3.433	5.457	8.039	11.267	15.279	20.314	26.834	36.021	60								
65	0.193	0.774	1.754	3.154	5.000	7.338	10.228	13.766	18.096	23.467	30.359	40.000	65							
70	0.180	0.718	1.627	2.919	4.616	6.754	9.379	12.555	16.381	21.011	26.699	33.945	44.019	70						
75	0.168	0.670	1.517	2.717	4.290	6.262	8.669	11.557	15.000	19.099	24.011	29.997	37.583	48.074	75					
80	0.156	0.628	1.418	2.542	4.008	5.838	8.063	10.718	13.856	17.550	21.906	27.085	33.363	41.271	52.161	80				
85	0.148	0.590	1.334	2.387	3.760	5.470	7.542	10.000	12.890	16.262	20.193	24.793	30.227	36.782	45.000	56.277	85			
90	0.140	0.558	1.260	2.252	3.543	5.148	7.086	9.378	12.058	15.168	18.760	22.919	27.751	33.433	40.250	48.769	60.420	90		
95	0.132	0.528	1.192	2.130	3.348	4.862	6.684	8.832	11.334	14.222	17.541	21.345	25.718	30.774	36.690	43.765	52.574	64.586	95	
100	0.128	0.500	1.130	2.022	3.178	4.606	6.326	8.348	10.698	13.398	16.484	20.000	24.008	28.587	33.856	40.000	47.322	56.412	68.775	100

50 years of modelling

Looking back is so nostalgic . . . but model making goes marching on — and so does F. C. COXON!



IN the January 10 issue of MODEL ENGINEER the article "50 Years Ago" caused me to glance back, amusedly, over quite an interesting life, much enlivened by modelling. Then, three weeks later, Vulcan in his weekly commentary made it clear that readers' stories about their models were welcome though, he pointed out, it was difficult to persuade model engineers to write about them.

I was introduced to this absorbing hobby in 1900, when—as a small boy of four—I found myself an enthusiastic spectator during the construction of a large scale-model by my architect father. *My* contribution consisted of gluey fingermarks, but when cleaned of these the model stood revealed as the architect's dream-scheme for improvement of an important cross-roads in London, where—even then—traffic problems were becoming acute.

I still have the drawings of this project, and from them have made the accompanying illustration; all the more easy to do because nothing can erase from my memory the fascinating things displayed so long ago, in miniature, before the clutching hands of monkey-hood. There were tiny hansom-cabs, horse-buses, carts and some of the first motor-buses (which for some years afterwards had difficulty in climbing the fearsome gradient of Ludgate Hill !). Apart from a certain amount of cast-iron filigree work the conception looks strangely "modern," and since then I have made models of many bypasses and flyovers for our roads of today.

Thoughts of this old-time model bring back to my ear the exciting clatter of horse-drawn traffic over the granite setts of city streets and the thump of paviors using their huge wooden rammers when repairing the carriageway. How one admired too the incredible agility of those Aussie-hatted street sweepers in Westminster, steering their dustpan-and-brushful way over the wood-block paving among the horses' feet !

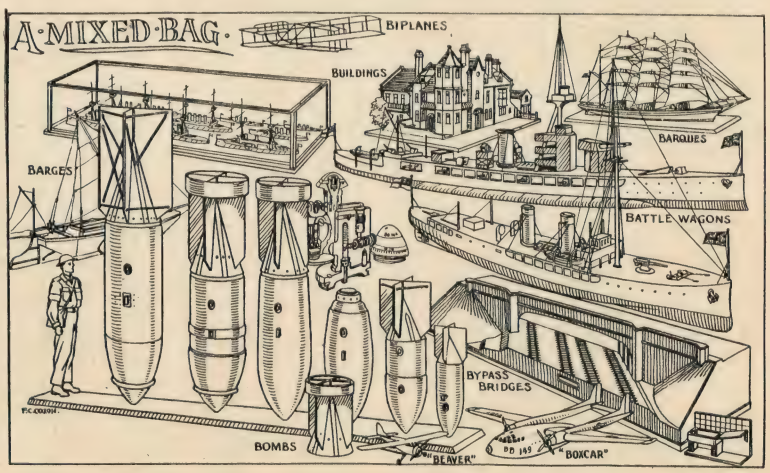
Models of buildings were needless to say more usually to be seen under construction at my home, and I tried to make some of these too quite early on. But my real love was ships; not to be wondered at since London's seaborne commerce passed daily in view from my bedroom windows. And so, at about the age of 15, my first serious modelling venture was undertaken, following the great naval pageant in the Thames.

For some weeks, in glorious summer weather, one long glittering parade of moored warships formed a continuous line-ahead from below the Nore right up to the Pool of London: vast capital-ships downstream giving place to smaller and smaller vessels until a tiny submarine formed a full stop just above Tower Bridge.

Recognising them hull-down

We fortunate schoolboys, living on the sea's edge, were able to recognise ships hull-down as unerringly as a glance from present-day "gen merchants" can identify jet planes from a glimpse of fin-and-rudder. And we were inevitably drawn towards ship modelling by this fabulous display of glamorous battle-wagons. So ship model we did—in the intervals of "playing the wag" to go sailing of course.

With the aid of my parent (himself the son of a shipmaster) I learned to curb my exuberance and turn out models with some pretensions to scale —though most of my warship data at that time came from Press pictures, postcards, and all figures as to dimensions, armament, etc., were either begged or stolen. However,



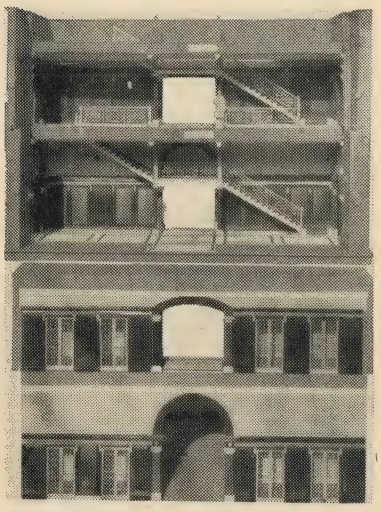
it's marvellous what one accomplished with such chancy raw materials, plus glue, paint and wood from those finely-made butter boxes which the grocer gave away. This wood, practically grainless, was just the thing for hulls.

Having assembled all the marine data I could, the long evenings were spent happily turning out solid models to a scale of 1 in. to 150 ft, finally encasing the miniature fleet in glass. Some drawings were made too—bow, broadside and deck views—a description of their making, and the whole submitted to a popular boys' paper. Imagine the surprise and delight when a letter arrived containing a cheque for two guineas.

As a matter of interest these models, in the original glass case, are still with us though now belonging to a friend who keeps an antique shop—which makes me feel a little antique myself ! The reproduction of my drawing also survives, and serves as a reminder of the days when two guineas *bought* something.

About this time too I was trying, somewhat uncertainly, to make flying models of the Wright biplane which I had seen in the air at Eastchurch—flown, I was told, by the Hon. C. S. Rolls. Though carefully constructed *my* biplane glider refused to glide very far, until one day, the elevator being set just right and the wind helping maybe, she flew straight out to sea from the clifftop and was seen no more !

War came soon after, with years of infantry vicissitudes to prevent modelling. But, attached to the R.A.O.C. towards the end, I managed to section some interesting gun fuses as a sort of consolation prize.



Model of a department store's staircases and bronzework

A model that helped the war effort . . . training men in the technique of entering a bombed building

Two troubled decades between the wars produced more models, such as the one illustrated, which shows staircases and bronzework for a large multiple store, and various toys for growing children were usually in hand. Then hostilities again, and I think every bomb Jerry dropped locally had its corresponding scale model soon after, turned up out of whitewood and finished with correct colours and tail markings. These miniatures were used for training A.R.P. wardens and others who were likely to meet with the real specimens, and the models still survive even if some of the personnel do not.

Aiding rescue work

Another sizeable model which still exists (of which I give a photograph taken before completion) was used to train men of the rescue service in the technique of entering bombed buildings. All the furniture, etc., in this model was made to scale before being ruthlessly " destroyed " under the falling floors and masonry. This static model was followed by a working one, in which the rescuer was shown cutting the wrong beam as he tunnelled through the debris, resulting in the collapse of the floors and superincumbent rubble above him, thus necessitating the rescue of the rescuer. One of those *verb. sap.* models ! When turned upside-down after the demonstration the floors returned to their original position, to be secured there by a split pin until required to function again.

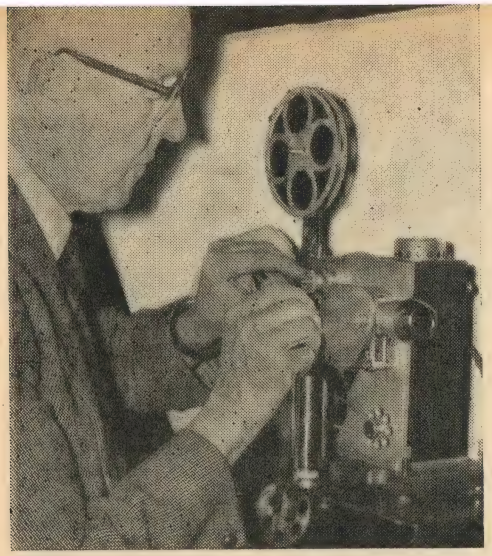
Scale-model shoring systems for the support of bomb-weakened walls and timbering for shafts and tunnels were also made, proving very useful to illustrate lectures. There were too miniature levers, tackles, derricks, and so on. Then the proverbial " kitchen sink " was modelled, together with electric cooker, carpet sweeper and all household requisites for a doll's house, these activities helping to pass the lulls during night duty in underground control rooms.

Well, since peace broke out it has been a case of getting back to ship models again, plus the odd 1/72 scale aircraft for the Royal Observer Corps. But in spite of supersonic jet planes I still think fondly awhiles of the Wright stick-and-string biplane, " the one that got away." ▣

HISTORIC LOCO MODELS

Locomotives Worth Modelling, by F. C. Hambleton, gives descriptions of many famous engines of the pre-grouping period including: the old Midland No 1447; London and South Western No 591; London Chatham and Dover No 145; the famous Great Northern Number One; and the Manchester, Sheffield and Lincolnshire No 694.

Lavishly illustrated throughout its 176 pages with detailed drawings it is obtainable from Percival Marshall and Co. Ltd, 19-20, Noel Street, London, W.1, price 10s. 6d., postage 8d. (U.S.A. and Canada $2.50).



THE CHINGFORD EXHIBITION

"Plenty to delight the live-steamer"

Joseph Martin finds that steam still casts its magic spell at this popular East London show

BERT STANNARD made a tiny model of the *Nova Espero*, fitted the model into a flashlight bulb and felt reasonably pleased with himself—until someone came forward with a criticism. It was all very well showing a vessel inside a 2.5 v. bulb, but the bulb *no longer worked.*

"Come back tomorrow morning," said Mr Stannard equably; and on the following morning, sure enough, the indignant critic found that he could light up the bulb and the model inside it by clicking over a switch.

I doubt if there were any new complaints when Mr Stannard displayed this minute model—it lay on black velvet—at the exhibition held by Chingford and District Model Engineering Club in the Conway Hall, Walthamstow, London.

Putting boats alliteratively into bottles and bulbs is, for this accomplished modeller, a serious craft based on a sound knowledge of ships and their history. The Thames barge, Humber keel, Norfolk wherry and Brixham trawler—all these have been accommodated by Mr Stannard in junket bottles. Like most ship modellers, he is particularly concerned with vessels which are disappearing.

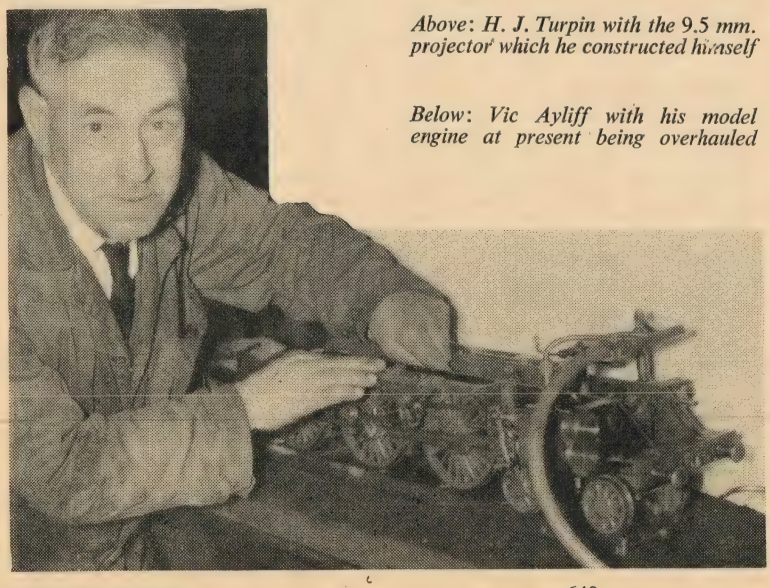
Ships are important also to Stanley Lieper who partnered Bert Stannard in organising the show under the general guidance of secretary Alfred Senchell and chairman Fred Kistler. Mr Lieper models a nineteenth-century sailing cutter with the same loving skill that he brings to his locomotives—such as his O-gauge G.N.R. Stirling Single.

But we expect skill and versatility from the veterans at Chingford; above all from the brilliantly inventive H. J. Turpin, one of whose contributions to the show was the steam-driven outboard motor described in MODEL ENGINEER of 3 April 1952. The ability and zeal of the oldtimers can be taken for granted. What may interest us more is the keenness shown by the younger people.

I met one of them—Kenneth Head, a railway enthusiast who works in 4 mm. scale. Kenneth exhibited a Britannia *Tornado* (a Union Pacific articulated chassis), the *Royal Scot*, and several other examples of 4 mm. craftsmanship. The *Tornado* had been built from a cocoa tin and a brass stair-rod. It took 300 hours to model and the interests of accuracy in the smallest details required several trips to Liverpool Street.

Here, then, we had enthusiasm, devoted patience and initiative—qualities which have taken the model engineering movement forward from its pioneering days. No club need worry much about the future so long as it has young members who can conjure a detailed Britannia from a cocoa tin or—like Cliff Pratley in this exhibition—enhance the OO layout with trees made from coloured tea leaves. I am told that Cliff put the leaves on the branches one at a time.

Then there is Anthony Jacobs. I met Anthony while he was putting the finishing touches to the Oyster Creek Railway which he built in collaboration with Barrie Deamer. This is Emett's O.C.R. in every familiar detail. It occupied a space 11 ft × 2 ft and was displayed in an annexe where the public also saw the 22 ft layout on which F. A. Barrett has worked for 15 years.



Above: *H. J. Turpin with the 9.5 mm. projector which he constructed himself*

Below: *Vic Ayliff with his model engine at present being overhauled*

A. Jacobs with his Emett railway

David Dunlop and Vic Ayliff at the club layout

Over everything lay the spell of steam. Bill Bull's O gauge track, Alan Lawson's layout in 4 mm. scale, the drawings of railway badges by schoolboy David Jackson, the 7 mm. 0-6-2 Taff Vale locomotive by A. F. Murray, the 4-4-2 *Firefly* on the passenger track, were all different expressions of a common interest.

There was plenty to delight the live-steamer. George Eley and Douglas Houchen offered a fine array of locomotives, including two conspicuous traction engines, and we saw an excellent variety of work from Fred Kistler, M. J. Broad, Fred Miller, H. Lynch, G. E. Nash, J. Bukin, L. J. Purchas, L. H. Joyce, A. W. Bull, W. R. Thomas, W. Garner and S. C. Hine.

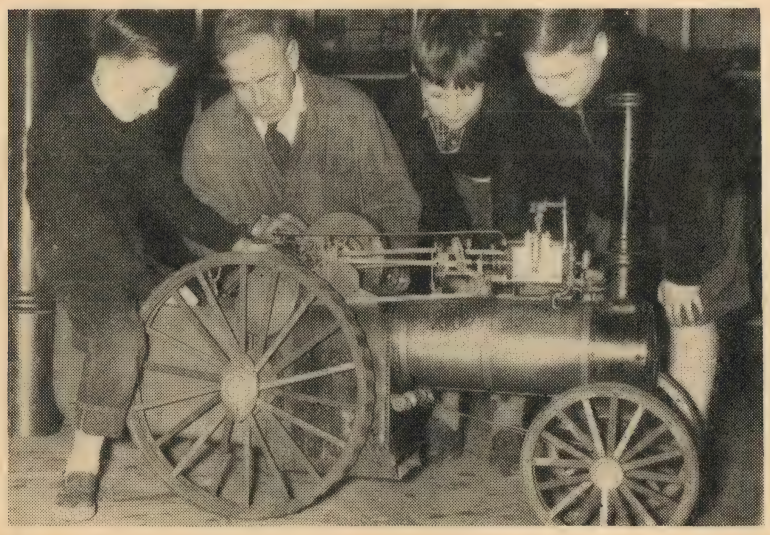
Chingford and District M.E.C. contributed a very attractive stand to the Model Engineer Exhibition last year, and it was no doubt William Appleby's well-remembered museum which had inspired the Old Curiosity Shop at the Conway Hall.

Fascinating odds and ends had been brought together to create a focus of quiet interest, in contrast with the lively scene at the demonstration workshop. Bill Street and " Tom " Thomas were busy at the bench, and H. V. Joyce—" Pop " Joyce to hundreds—was always finding something to do. Three generations of the modelling family Joyce played a part in the show.

The club, which enjoys enormous goodwill through its famous Ridgeway track, must have won many new friends during its three days at Walthamstow. On the first day Vic Ayliffe, the vice-chairman, sprang a happy surprise by awarding a cup for the best exhibit in OO gauge. It was won by Ken Head, while the *Walthamstow Guardian* Cup for the best finished model in the exhibition went to Bill Bull for his O gauge track, G. E. Nash gained second for his *Hielan' Lassie* and H. J. Turpin third for his M.E. outboard motor.

When I left the Conway Hall, Pop Joyce's campanile was pealing out grandsire triples. Everyone looked happy and I took away with me the impression of a very friendly club whose members of all ages are kept vigorously youthful by the creative interests which they share. ▣

Vic Ayliff explains the traction-engine's controls to three visitors (left to right), K. Newman, Barry Couchman and Sidney Hillson



BELT DRIVES

Belt Drives in the Small Workshop by Duplex is a small useful book dealing with light transmission belts in all forms suitable for small power. It costs 3s. 6d. plus 3d. postage if ordered from the publishers, Percival Marshall and Co. Ltd, 19-20 Noel Street, London, W.1 (U.S.A. and Canada $1.00).

FITTING BEARINGS

Plain, ball and roller bearings are described fully in *Bearings and How to Fit Them* by Ian Bradley and Norman Hallows.

The authors give details of the best materials and methods for constructing bearings, and describe their various applications, particularly with regard to the small workshop.

The book is obtainable from Percival Marshall and Co. Ltd, 19-20 Noel Street, W.1, price 3s. 9d. post paid (U.S.A. and Canada $1.00).

LOCOMOTIVES I HAVE KNOWN

Number 32 by J. N. Maskelyne

YES, there really *was* an engine like this ! In fact, at one time there were as many as seven and they belonged to a set of 13 engines which had a very interesting history; the tale, however, is far too long to be repeated here in full detail. No 143 was the one that I knew best, so I shall devote this article to her, primarily.

I first met her at Chester in the summer of 1918, and at once noticed that her appearance was quite unlike that of two of her sisters, Nos 141 and 146, who were often to be seen at Chester at that time. I also noticed that whenever these three engines came to Chester, they approached from the direction of Crewe, not from Birkenhead or Shrewsbury, and they never went to the Great Western running-sheds.

To me, this seemed rather odd, until I discovered that, due to the fact that there was a war on, the engines were on loan to the London and North Western Railway.

The main attraction of No 143 was her delightfully absurd appearance; but, for me, the unusual, and even grotesque, often had a strong fascination. In the case of No 143, the effect was due to the fact that she had acquired a Wolverhampton boiler with a tall dome, set far forward on the barrel, and with a rather prominent raised firebox casing; the whole lot was set very low in the frames, which were of the slotted, sandwich type having outside bearings.

Just to add the final touch, so to speak, a short chimney with a rather heavily-moulded copper cap had been fitted, while the tender was a second-hand one from a different class of engine !

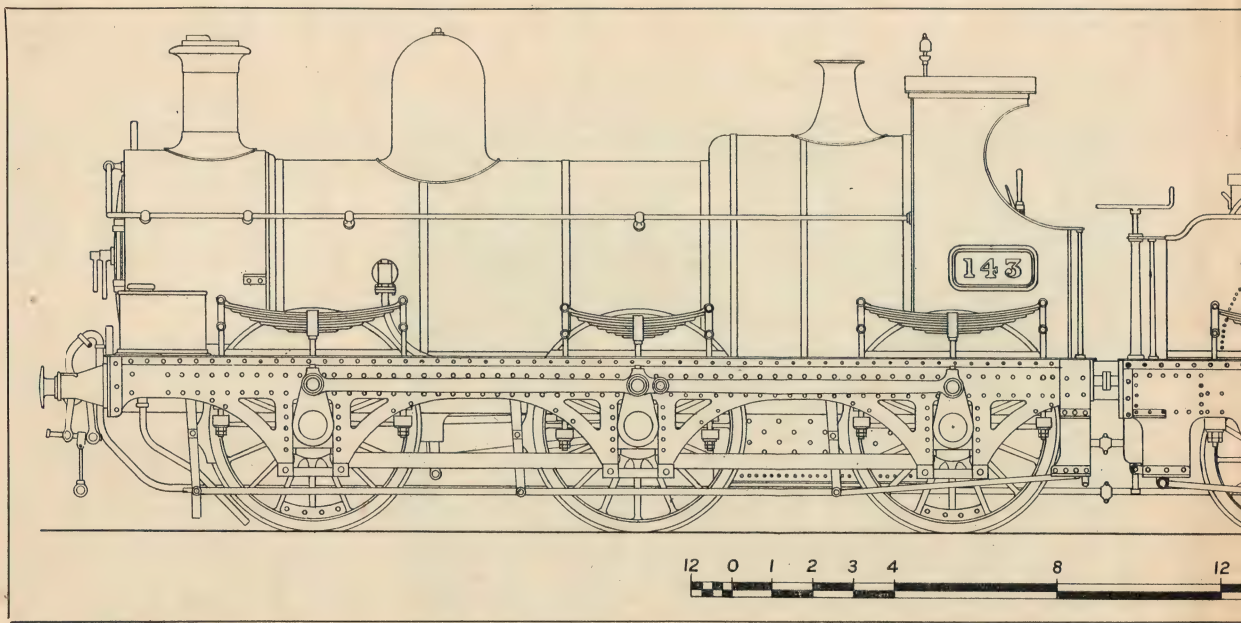
I always took great delight in oddities of this sort, so long as they were not downright silly, though I must admit that it was sometimes difficult to decide just what was silly and what was not.

No 143, in spite of her age, was a hard worker, due to the prevailing conditions at the time. She usually brought in fairly heavy mixed-goods trains to Chester from Crewe and then spent much time in shunting and marshalling in the Chester yards. The return to Crewe would usually be with part of a South Wales coal train brought in from the south by a massive 2-8-0 engine from Cardiff.

She seemed to have plenty of power and could get away without much bother at the head of a 45-wagon coal train, though I was told at the time that the official limit for such a train, behind an engine of this class, was 33 wagons. In wartime, however, I noticed that official instructions were subject to variations of interpretation that may not be official.

No 143 was built at Swindon in 1886, and it will be noted that the

G.W.R. 0-6-0 No 143 . . . . .



outside frames were of the Gooch slotted type, first introduced by Daniel Gooch as far back as 1838, and known as sandwich-frames because of the mode of their construction. Each frame was formed of two slotted plates held together by cast-iron (originally oak, or teak) blocks placed between them.

The inside frames were of the ordinary plate variety, stayed by the front and back bufferbeams and by flat stays—at convenient places along their length—to the outside frames. This form of construction resulted in a very strong and rigid foundation for the whole engine; and it would make a nice little exercise for model makers, especially if the 222 rivets in each outside frame are correctly represented !

The coupled wheels were 5 ft 2 in. dia.; the wheelbase was apparently subject to some variations in spacing, as well as in total length, in the various batches built. As far as I could discover from official data, the total wheelbase was 15 ft 9 in. divided i nto 8 ft plus 7 ft 9 in. The overhang was 5 ft at the front and 3 ft 5 in. at the back. The tender wheelbase was 15 ft divided into 6 ft 2 in. plus 6 ft 10 in., with overhangs of 4 ft at the front and 3 ft at the back.

The boiler was pitched 6 ft 8 in. above rail level; the barrel was 11 ft long and made in three rings, the largest of which was 4 ft 2 in. dia.; and a raised round-top firebox was fitted. There were 246 tubes of $1\frac{5}{8}$ in. dia., the heating surface of which was 1,127 sq. ft; the firebox heating surface was 122 sq. ft, making the total 1,249 sq. ft.

The cylinders were 17 in. dia. and 24 in. stroke, and the working pressure was 140 p.s.i., at 80 per cent. of which the tractive effort was about 14,260 lb.

No 143 was running in this condition from November 1907 until she was withdrawn for scrap in August 1919. Officially, she was a " renewal " of a former engine of similar design and carrying the same number. It would appear, however, that nothing whatever of the older engine was used in the renewal which, therefore, was a brand new engine when built.

It should be recorded that when No 143 had been rebuilt in November 1907 into the form depicted in the drawing, she had a longer chimney; the short one that I have shown dated from about 1916, when many engines of different classes were being fitted with shorter chimneys. The reason is said to have been that the reduction in the chimney length improved the steaming of the boilers.

No 146 was the last survivor of this very interesting class; in 1915 she was fitted with a boiler similar to 143's, but she acquired one of a different type in 1917, and another, having a Belpaire firebox, in 1920. She ran with this one until she was withdrawn in April 1925. I believe she was the last sandwich-framed 0-6-0 to run on the G.W.R.

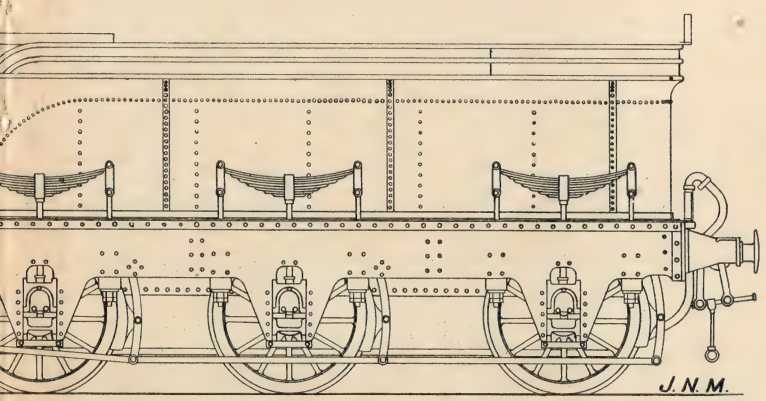
I commend the curious No 143 to anyone who would care to build a model that is a little out of the ordinary, at least in appearance. The slotted sandwich frames are the only feature which would require rather more than the usual time and patience to reproduce. Their marking-out would require care, and I must add that the radius of the curves of the lower edge was 3 ft $7\frac{1}{2}$ in. and the minimum depth between hornplates was 12 in.

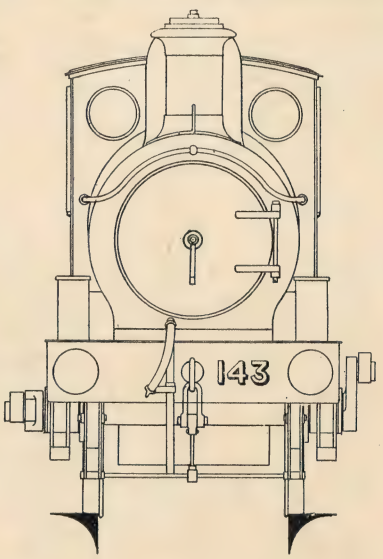
None of the other details should present any special difficulty, since, in spite of their peculiar appearance, they were all fairly straightforward.

The performance of these engines certainly gave the lie to their " old crock " appearance. On goods trains they could develop quite an astonishing amount of power, while their use on passenger trains showed them to be capable of running at fairly high speeds when called upon to do so.

The only one of this class that I ever saw in the London area was No 132 ; one day, early in 1916, I was surprised to see her at Reading, on a passenger train bound for Didcot where I believe she was stationed at that time. Except for this solitary stray, the entire class spent the whole of its existence in the Northern Division, and never came further south than Birmingham. ▣

. . . 'A really quaint specimen'





16

The children's own locomotive

L.B.S.C. takes a rest between serious work to describe an engine that kiddies can use

MANY of the good folk who have built locomotives from designs given in these notes are married men with families, and in most cases the young hopefuls are exceedingly interested in dad's engine. Nothing would please them better to have it on the track with steam up at times when dad isn't available; but they are unable to do so for two good reasons.

One is that it is usually too big and heavy for a child to carry to the track and lift on to the rails; secondly, it would need more skill—and probably patience !—than the average child possesses to fire and drive the engine and operate it in the proper manner.

Now a few sympathetic "dads" who remember the time when they were children themselves have suggested at various times that I should give a brief description of a small locomotive which any child could operate, and which would be simple and cheap to build. Jack and Jill could then enjoy themselves to their hearts' content; and if there should be a pitch-in, children being what they are, repairs or even replacements would be easy and inexpensive. With our editor's permission I am glad to oblige.

Casting memory back over the years, I recollect a small single wheeler that I built when I was still at school. Her frames and superstructure were made from stout tin and the wheels were light brass castings. The cylinders were made from brass tube. The boiler was a long tin canister fired by four spirit burners mounted on a tube and supplied with spirit from a reservoir under the cab.

She had a six-wheeled tender which was merely an ornament and carried neither fuel nor water; actually she did not need it, as she would run about 40 min. with the water in the boiler and the spirit in the tank. She could go all right, and could pull several coaches. As the wheels were given to me, and the cylinders were home-made, she cost me nothing, but she gave me much pleasure. Incidentally, this was the engine on which I tried my successful remote-control experiments.

The locomotive shown in the accompanying drawings is a modernised version of the same kind of engine. The frames are 16-gauge steel or brass, and the buffer and drag beams are brass angle. The wheels are light castings and the axles run in bushed holes in the frame. The cylinders are built up from brass tube as before, but better fitted. They are of the single-acting oscillating type, and are reversed by a simple valve operated from the cab.

As the children will need to operate the engine outdoors, a "pot" boiler with open spirit flames underneath would be useless, as the slightest puff of wind would deflect them from under the boiler and steam would fail at once. I have, therefore, substituted a simple water-tube boiler of the usual type.

The boiler itself is a piece of thin copper tube mounted on a 16-gauge copper backhead, the front end being closed by a flanged disc of 16-gauge copper; two water-tubes are fitted. The casing can be made up from thin sheet iron or steel, but if a tin can of required length is available it will do just as well if lined with $\frac{1}{16}$ in. asbestos millboard.

Fittings consist simply of a safety-valve, screwdown valves for regulator and blower, and a valve or cock for testing water-level when filling. Any shape of cab, chimney, etc., can be substituted for those shown, to suit builder's or children's wishes.

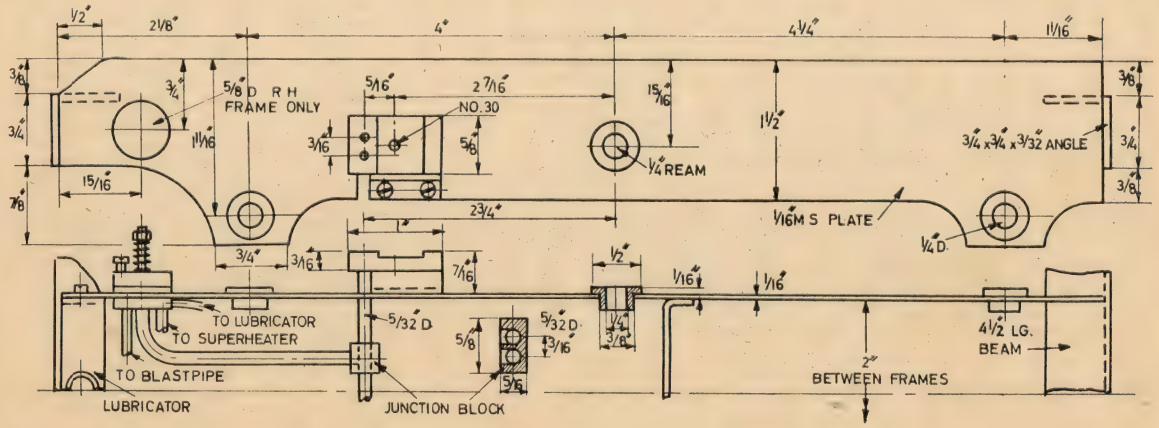
I have kept the whole bag of tricks as small and light as possible to make her easy for the children to carry and handle, and also to keep cost and labour to the minimum. As shown, she is arranged for a $2\frac{1}{2}$ in. gauge line, but can be adapted for $3\frac{1}{2}$ in. gauge by making all the parts half as large again, and making the overall width of frames $3\frac{1}{8}$ in.

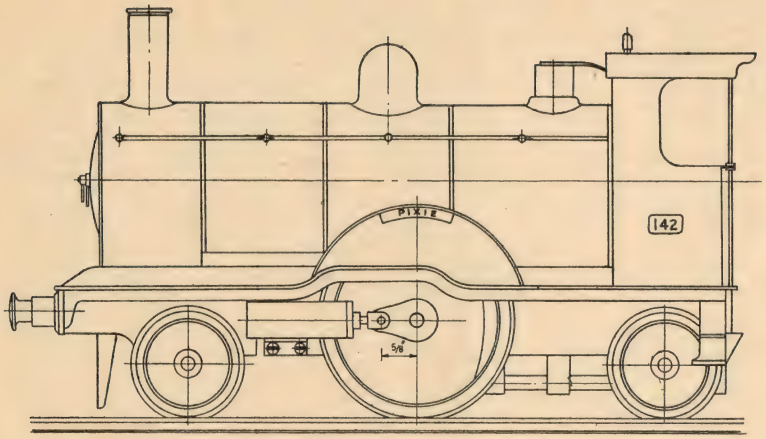
FRAMES AND RUNNING-GEAR

For the frames, two pieces of 16-gauge steel, brass, or tinplate, each 2 in. wide and $11\frac{1}{2}$ in. long, will be required. These are temporarily fixed together and sawn and filed to shape and dimensions indicated in the usual way. Drill the holes for axle-bushes with $\frac{3}{8}$ in. drill and turn up the bushes from bronze or gunmetal if available; if not, brass will do. The holes for the driving axle should be reamed, but plain drilling will do for the leading and trailing; these axles should fit easily so that the driving-wheels carry most of the weight. The bushes should fit tightly.

At $2\frac{3}{4}$ in. ahead of driving-bush centre, cut a $\frac{3}{16}$ in. slot $\frac{3}{4}$ in. deep for the steam pipes. The $\frac{5}{8}$ in. hole

Details of the frames





near the front end is for the reversing valve. The buffer and drag beams are 4½ in. lengths of ¾ in. × 3/32 in. angle (brass or steel) slotted to take the frames, which are attached either by angles and rivets, or by silver soldering.

The leading and trailing wheels are 1¾ in. dia. on tread, and the driving-wheels 3¼ in. with treads 5/16 in. wide, and flanges 1/16 in. wide and a full 3/32 in. deep, rounded at the root. The bosses stand 1/16 in. out from the rims and are reamed to a squeeze fit on the ¼ in. axles, which are 3 3/16 in. long and need no turning. The wheel castings should be as light as possible; the number of spokes doesn't matter.

The castings are turned in the way described in detail in previous notes; the holes for the crankpins are drilled No 32 at ⅝ in. from centre, and the crankpins are merely pieces of ⅜ in. silver steel squeezed in. They should project 9/16 in. from the wheel boss. Press one wheel on each axle, push through the bushes and press on the other wheel. The crankpins are exactly opposite to each other, at 180 deg., and the distance between the backs of the flanges should be 2 9/32 in.

CYLINDERS

Each cylinder is made from a piece of thin brass tube, the ends being squared off in the lathe to the length shown. If the inside of the tube isn't smooth, wind a piece of fine emery-cloth around a bit of wood about ½ in. dia. until it is an easy fit in the tube. Hold this improvised lap in the chuck with the tube on it, run the lathe at the highest speed and move the tube up and down the lap. A minute or so of this treatment will produce a polished bore.

One end of the tube is closed by a disc of brass ⅛ in. thick. If a press fit it will need no setscrew, but solder over it as an extra precaution. For the other end chuck a bit of ⅝ in. rod, face, centre and drill No 30 for ⅜ in. depth. Turn 5/32 in. length to a very tight fit in the tube, part off at 5/16 in. from the end, and reverse in chuck and turn the boss.

The piston and rod are fitted exactly the same as those for *Virginia* and other engines. Pack the groove with graphited yarn, and before putting the cover on drill a No 55 vent-hole in it. The big end is filed up from ¼ in. square brass and screwed on to the end of the piston-rod as shown.

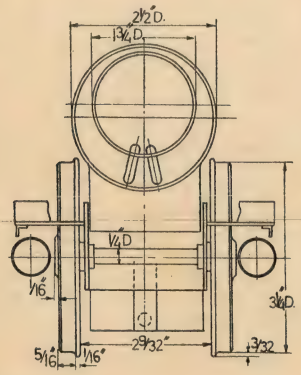
Before fitting the piston permanently, the portblock must be made and attached. This is made from a 1 in. length of ⅝ in. × 5/16 in. brass bar. Drill a No 40 hole in the middle and tap it ⅛ in. or 5 B.A. At 5/16 in. from this, on the centre-line, drill a No 43 hole. One side must be hollowed out to fit the cylinder barrel. If you have a ⅝ in. reamer or endmill, put it in the three-jaw, clamp the portblock under the slide-rest tool-holder level with lathe centres and run it up against the reamer or endmill until it is recessed to within 3/16 in. of the rubbing-face.

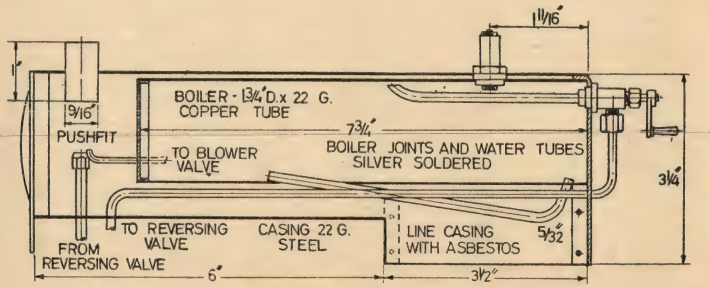
If you haven't a reamer, make a flycutter by drilling a 3/16 in. hole across the end of a 3 in. length of ½ in. rod, fitting a setscrew in the end, and fitting a little roundnose tool made from 3/16 in. silver steel in the crosshole. If the cutting edge of the tool is set 5/16 in. from centre, and the portblock traversed along it while clamped under the tool-holder, it will soon cut the recess to the exact radius. Solder the portblock to the cylinder and fit a ⅛ in. trunnion as shown. Drill the port through into the cylinder and scrape off any burr inside.

PIPES AND REVERSING-VALVE

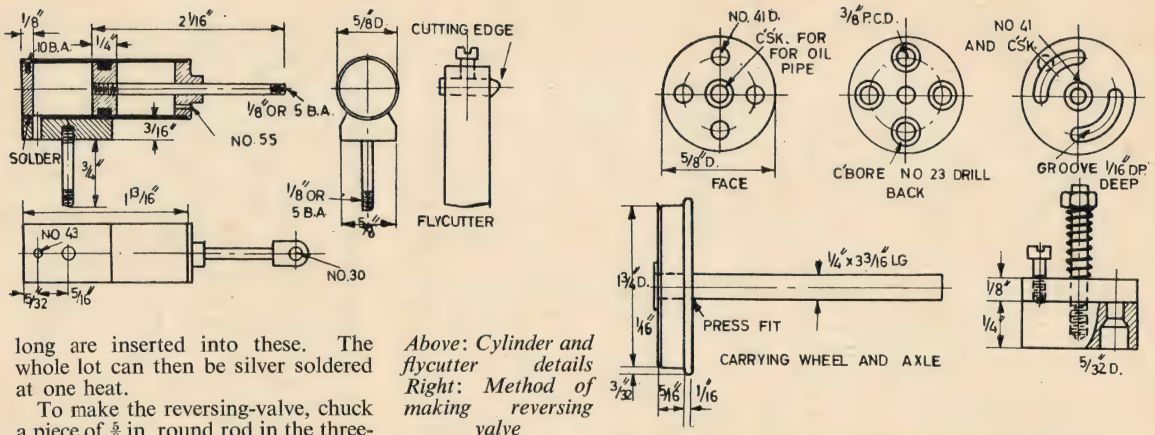
As the cross pipes are either steam or exhaust according to the way the engine runs, they are made the same diameter and so are those connecting them to the reversing-valve. The blocks carrying the cylinders are two 1 in. lengths of ⅝ in. × 3/16 in. brass bar, drilled as shown in the elevation of the frame drawing, and recessed as shown in the plan. The backs of the No 43 ports are counterbored No 23 to take the ends of the 5/32 in. crosspipes. These are 2¾ in. long.

Before silver soldering them into the carrying-blocks, a double junction-block is attached at 1 in. from the right-hand end. This is just a piece of 5/16 in. square rod ⅝ in. long with two 5/32 in. holes drilled through it as shown; it is slipped over the cross-pipes before putting on the carrying-blocks. Two No 23 holes are drilled into the side of the junction-block, piercing the cross pipes, and two pieces of 5/32 in. pipe each 2⅞ in.





Top: *The general arrangement*
Left: *Section of driving axle*
Below: *Details of the boiler*



Above: Cylinder and flycutter details
Right: Method of making reversing valve

long are inserted into these. The whole lot can then be silver soldered at one heat.

To make the reversing-valve, chuck a piece of $\frac{5}{8}$ in. round rod in the three-jaw, face, centre, drill No 41 for about $\frac{1}{2}$ in. depth, and part off two slices, one $\frac{1}{4}$ in. thick and the other $\frac{1}{8}$ in. thick. On the $\frac{1}{4}$ in. one make four centrepops on a $\frac{3}{8}$ in. circle, drill them right through with No 41 drill and counterbore the backs with No 23 drill to take 5/32 in. pipes. Countersink the middle hole on the opposite side and drill a No 32 hole in the thickness, into one of the other holes to take the oil pipe.

Countersink the hole in the thinner slice and set out the four pop marks as above, but instead of drilling through, just make countersinks a full $\frac{1}{16}$ in. deep and connect each pair by chipping a groove as shown. This is easily done with a little chisel made by filing off the end of a piece of $\frac{1}{8}$ in. silver steel at an angle, and hardening and tempering it.

I do jobs like this with a dental burr on my little vertical milling-machine which has a revolving table, but there is no need to go to any elaboration as long as the steam can get through freely ! A 3/32 in. set-screw is fitted in the opposite side, right in the middle of one of the grooves, to accommodate the end of the reversing or reach-rod which is operated by a lever in the cab.

All contact faces are trued up by rubbing on a piece of fine emery or other abrasive cloth laid working side up on the lathe bed or something equally flat and true. Don't neglect to do this job before starting on the assembly, or you've had it.

Bend the ends of the two pipes attached to the junction block, as shown in the plan view of frame, and insert them into the holes in the back of the reversing-valve above and below the oil hole. Put a piece of $\frac{1}{8}$ in. pipe about 3 in. long in this. In the other two holes fit short lengths of 5/32 in. pipe with $\frac{1}{4}$ in. $\times$ 40 union screws on the end, for connecting up to the superheater and blastpipe. All the pipes can then be silver soldered to the reversing-valve. After pickling, clean up the contact face and attach the grooved plate to it with a trunnion pin, spring and nut as shown.

Each carrying-block is attached to the frame by a $\frac{3}{4}$ in. length of $\frac{7}{16}$ in. $\times$ $\frac{1}{8}$ in. $\times$ $\frac{1}{16}$ in. angle; if a piece of extruded commercial angle isn't available, just bend up a piece of 16-gauge sheet brass in the bench vice to the dimensions given. The longer part of this is attached to the underside of the carrying-block by two countersunk screws, or it may be held in place by a single screw and then silver soldered, a job which could be conveniently done at the same heat when fixing the pipes and junction-block. Drill two No 41 holes in the angle below the block for the screws attaching it to the frames.

LUBRICATOR

The lubricator is a 2 in. length of $\frac{1}{2}$ in. brass or copper tube with a disc of 16-gauge similar metal silver soldered into each end. In the middle of the tube, silver solder a $\frac{1}{4}$ in. $\times$ 40 bush for the filling plug and, diametrically opposite, a $\frac{1}{2}$ in. length of 5/32 in. tube, screwed at the end and furnished with a blind cap made from $\frac{1}{4}$ in. hexagon brass rod. This is erected between the frames at the leading end, just ahead of the reversing-valve, and fixed by a screw at each side running through a clearing hole in the frame into a tapped hole in the end of the lubricator.

If all goes well, next week I will show a drawing of the whole bag of tricks. Meanwhile, the easiest way to erect the assembly of pipes, carrying-blocks and reversing-valve is to remove the reversing plate with the trunnion and spring and bend the pipes attached to the valve about $\frac{1}{8}$ in. back so that the valve can just clear the inside of the frame when the carrying-blocks are in place.

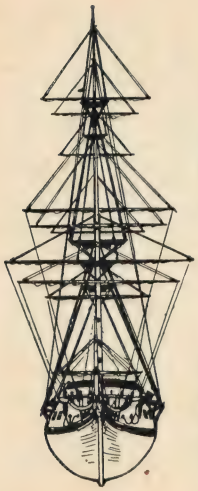
Insert the assembly from underneath, with the pipes attached to the reversing-valve passing over the front axle, then enter the cross-pipes into the slots in the frame and push them upward until the carrying-blocks are in the position shown in the elevation frame drawing. They are correctly located when a line drawn horizontally through the centre of the driving axle passes through the centre of the trunnion hole and exactly midway between the ports. This corresponds to valve-setting on a slide-valve engine.

The pieces of angle can then be attached to the frame. Run the No 41 drill through the frame, using the holes in the angles as guide, put 3/32 in. or 7 B.A. screws in and put nuts on inside the frame. This is preferable to tapping the frames, as they are too thin for a satisfactory thread.

The reversing-valve will still be on the inside of the frame, owing to the bent pipes, so very carefully push it through the hole in the frame until the pipes are straight again and the assembly looks like the arrangement in the plan drawing. The trunnion, spring and grooved plate can then be replaced. Put the cylinders on the carrying-blocks and secure them with a spring and nut similar to those on the reversing-valve. The tension should not be sufficient to cause excessive friction.

When putting on the cylinders, see that the big ends go over the crankpins. The driving-wheels should now turn freely by hand; and if a tyre-pump is connected to the steam-pipe (marked on the drawing "to superheater") and the lubricator pipe temporarily plugged, very little air pressure should make the wheels spin in either direction, according to the position of the grooved plate on the reversing-valve. These small single-action cylinders will naturally not have the power of double-acting slide-valve cylinders but they will develop a tidy kick nevertheless, and the engine will haul a train of coaches quite well.

● *Continued on page 656*



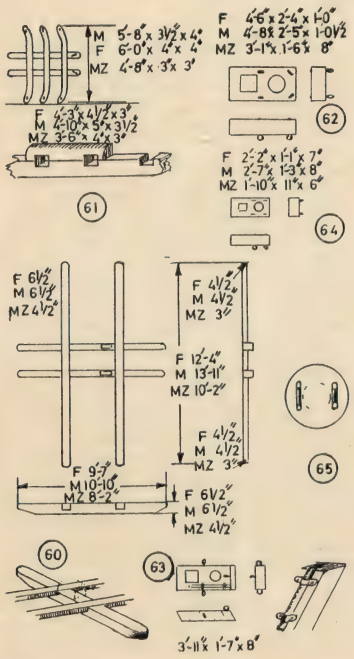
MYRMIDON

A SHIP-RIGGED SLOOP OF 22 GUNS

Part 5.—R. J. COLLINS is describing how to build a model of an 18th century man o' war. In this instalment the progress of the work reaches the end of the masts and yards

WHERE the upper masts connect to the lower are a number of fittings all a little more complicated than those of earlier ships. The first of these are the trestle-trees and cross-trees. Again, for their sizes, Steele presents us with a mass of fractions. I don't know whether I am particularly dense, but I find I have to read the instructions over several times to find out what he is getting at !

Some of the measurements so arrived at work out very fine, indeed, and I can't help wondering if the craftsman of those days really worked to a sixteenth of an inch on a piece of timber many feet long. The sizes I give are to the nearest half inch !



The framework consists of two pieces of timber, one either side of the mast, pointing fore and aft and resting on the hounds; and another two, fitted into them athwartship. The first is the trestle-trees and the second is the cross-trees. The under surface is tapered towards the ends and one part of the upper surface has a metal plate against which rests the topmast fid; another part has a rounded piece of wood called a bolster to ease off the angle for the shrouds.

Length of trestle-trees is given as one fourth the length of the topmast; in depth half the given diameter of the mast; and in thickness two thirds of the depth. The cross-trees are " one third the length of the top-mast deducting 6 in. [I presume from the cross-trees]; the breadth as much as the trestle-trees are thick; and the depth two thirds of the breadth."

To the nearest half inch this works out to the following: Fore trestle-trees 9 ft 7 in., thickness 6½ in., breadth 4½ in., cross-trees 12 ft 7 in., thickness 4½ in., breadth 6½ in.; main trestle-trees 10 ft 10 in., thickness 6½ in., breadth 4½ in., cross-trees 13 ft 10 in., thickness 4½ in., breadth 6½ in.; mizen trestle-trees 8 ft 2 in., thickness 4½ in., breadth 3 in., cross-trees 10 ft 2 in., thickness 4½ in., breadth 3 in. (Fig. 60).

Topmast trees

The trees of the topmasts are different, there being three cross-trees instead of two, and these are slightly curved backwards the equivalent of half their width instead of being straight.

In the front of the main top trestle-trees there is a sheave hole, one in each, for the fore top-gallant braces. In the mizen topmast trestle-trees the sheave is for the main top-gallant braces. At the end of each cross-tree is a hole through which passes the main top-gallant shrouds.

The ratio given by Steele is 3½ in. to every yard of the topmast, and the cross-trees one-third longer. I make them: fore topmast trestle-trees 4 ft 3 in. × 4½ in. × 3 in., cross-trees 5 ft 8 in. × 3½ in. × 4 in.; main topmast trestle-trees 4 ft 10 in. × 5 in. × 3½ in., cross-trees 6 ft × 4 in. × 4½ in.; mizen topmast trestle-trees 3 ft 6 in. × 4 in. × 3 in., cross-trees 4 ft 8 in. × 3 in. × 3½ in.

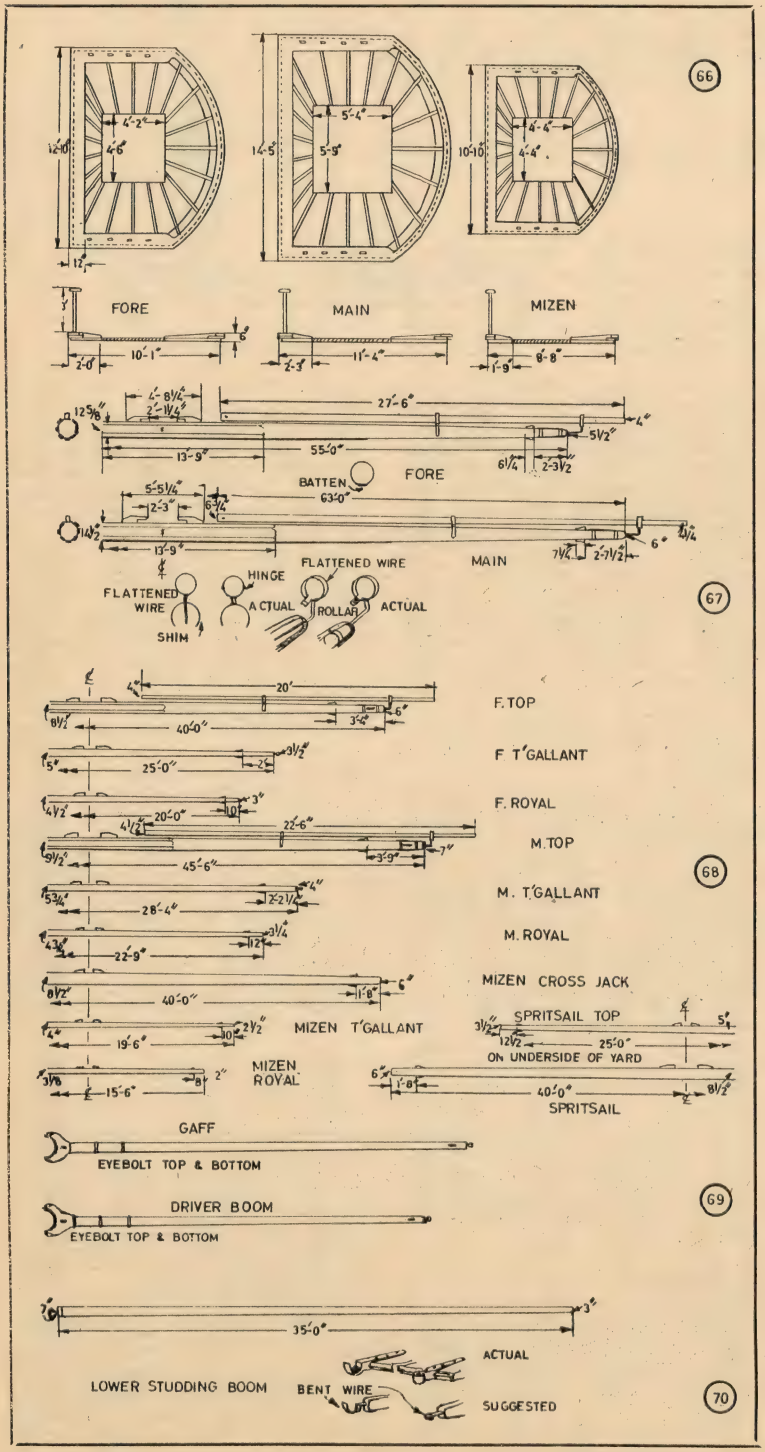
The cross-trees, although let into the trestle-trees, don't fit flush, being about one-third of their thickness above the level. There is a bolster here as for the lower parts (Fig. 61).

The other pieces in the connecting links between the lower and upper masts are the caps. These are roughly brick shape and have two holes; one square for the top of the lower mast-head and the other round for the lower portion of the upper mast.

Making the ring bolts

There are a number of ring bolts attached to their under surface. I make these out of softened pins. Drilling a hole first, I pass the pin through and bend the bottom part to the ring. If the caps are made of wood I have found it safer to make the holes in a larger piece and cut the cap after; they so easily split. Small caps I make from plastic.

Steele says the caps should be four times the diameter of its topmast plus 2 in.; breadth, half the length adding 1 in., and depth four-ninths of the breadth. There is a slight difference for the different masts. The round hole should be a little larger than the



given thickness of the topmast (a comfortable fit). In the real ship this hole was lined with leather.

The square hole is a tight fit for the top of the masthead. The between the holes is two-fifths the topmast plus half the difference between the bottom and top thickness of the masthead. The position of the eyebolts is shown on the drawings. Note that as is usual there are no sharp corners to the caps, but don't take off too much.

Dr Longridge, in his model of the *Victory*, shows a wooden bolster on top of the cap, but I can see no reference to such in Steele so I have left it out. The measurements (to the nearest half inch) of the lower caps are: fore 4 ft 6 in. × 2 ft 4 in. × 1 ft, main 4 ft 8 in. × 2 ft 5 in. × 12½ in., mizen 3 ft 1 in. × 1 ft 6 in. × 8 in. (Fig. 62).

The bowsprit cap, which has its top and bottom trimmed to the angle of the bowsprit, has a groove cut in nearly the whole length of one surface to take the jack staff. This, as well as the eyebolts, etc., are shown in the drawing. Size: length (overall) 3 ft 11 in. × 1 ft 7 in. × 8 in. Note that the centre line of the holes are half the diameter of the jack staff to port—to be exact, 1⅛ in. out of centre to the cap (Fig. 63).

The topmast caps are similar to the lower except for the position of the eyebolts. The sizes are arrived at by a similar set of proportions which I interpret as: fore topmast 2 ft 3 in. × 1 ft 1 in. × 7 in., main topmast 2 ft 7 in. × 1 ft 3 in. × 8 in., mizen topmast 1 ft 10 in. × 11 in. × 6 in. (Fig. 64).

The trucks (Fig. 65) at the extreme top of the masts are about 1 ft dia. and have a pair of small sheaves let into them for the signal halyards. On the lower trestle-trees rest the tops.

Trestle-trees' dimensions

For those who are interested here again are Steele's dimensions: "Their breadth athwartship one-third the length of their topmasts; their length fore and aft three-fourths their breadth; and the square hole athwartship two-fifths the breadth of the top, the fore and aft thirteen-fourteenths the breadth; and the aftside the hole one-fifth the length of the top from the aftside of the platform, placed in the middle athwartships."

In spite of my non-mathematical mind I make three-fourths of a third the equivalent of one-fourth of the whole. In other words, Steele makes his trestle-trees exactly as long as the full length of the tops ignoring the curved front to the platform. Athwartship, the top overlaps 3 in. either side. Furthermore, Steele's drawing shows the same overlap to both sets of trees;

it also shows the forward cross-tree shortened to conform with the curved front, but that is not necessary with the tops I have shown.

I made my tops just that much larger and these are the measurements I give. Fore and aft first: fore 10 ft 1 in. × 12 ft 10 in., hole 4 ft 2 in. × 4 ft 6 in., 2 ft from after edge; main 11 ft 4 in. × 14 ft 5 in., hole 5 ft 4 in. × 5 ft 9 in., 2 ft 3 in. from after edge; mizen 8 ft 8 in. × 10 ft 10 in., hole 4 ft × 4 ft 4 in., 1 ft 9 in. from after edge (Fig. 66).

For a ship of this size the floor of the top is made from 2 in. timber. So cut the tops from 1 mm. ply, the rim and capping piece being cut from the same material, if possible each as an entire piece. Glue them together and allow them to dry under a press so as to keep them flat.

The ribs are 2 in. thick and it will be noted that they do not radiate evenly from the centre. There is another timber along the after edge to take the base of the rails. These are 3 in. square, octagonal in the middle, and 3 ft high. A similar piece of timber as the base forms the top. When the tops are completed drill the holes for the strops of the deadeyes and the other blocks.

The tops must be secured firmly to the trees and these to the masts. I suggest you pin the trestle to the masthead and peg the platform to the trees. There will be quite a strain on the top caused by the upward pull of the topmast shrouds.

The yards

Now for the yards. Study these well before starting because, like the masts, they are far from being mere tapered lengths of wood. The main yards were generally two (at least) lengths scarved together but not in the obvious manner that the older types sometimes used and because of that it can be ignored in the model.

Roughly, the yard is divided into eight, the outer eighth being called the arms (this appeared to vary with different experts as sometimes the arms were the length outside the stop cleats). The middle two-eighths was called the slings. This middle section was planed eight square and parallel, and each surface except the front was strengthened by a batten.

There were a couple of cleats on the slings to hold the jeer ropes, horned for the lower yards but normal for the rest. At the arms were the metal fittings for the stunsail booms and also the stop cleats.

Steele's drawings of the yards of a 100-gun ship shows the battens of the yard touching each other along their length and so does Longridge but his sectional view of a yard of a 36-gun shows them separate and on all surfaces. He says, however, " nearly the same length and breadth . . . The foresides have no battens." I have decided to make my battens so that they do not touch and to leave the one off from the fore side.

I found the best way to make yards of this type was to plane up a length of wood eight-sided, to the correct thickness, mark off the length of the slings and, with a small plane, file, and later the edge of a razor blade, round and taper the rest.

The backs of the lower yards remain flat, but true to the taper, until the beginning of the third quarter. The diameter of the extreme end is three-sevenths the thickness at the slings. The boom-irons, both inner and outer, offer a fine little job for the metal worker, but a great deal can be simulated in a model of this size. The metal arm can be driven into the yard with the bands either of shim, which must be nailed on, or brown paper which can be stuck. I draw the perfect boom-iron and my suggestion and leave you to do what you wish.

The irons for the topsail yards are much simpler. The sling cleats are horned for the two lower yards but are more or less ordinary stop cleats for the others. The drawings will show their differences as well as their position. These cleats " are one and a quarter the diameter of the yard in length, with a shoulder one-third its length. The breadth one-fourth the length. The thickness two-thirds the breadth, and nailed once the diameter on each side of the slings." For the lower horned cleats the measurements refer to the overall dimension (Fig. 67 lower yards, Fig. 68 upper yards).

The stop cleats towards the ends of the yards are " half the diameter of the yards in length with the thickness one-fourth the length and depth two-thirds the breadth." For the lower yards they are within the arms, 1½ in. to every yard of the length. The diagrams give the actual sizes for every yard.

Studding sail and booms

The length and breadth of the yards are: fore 55 ft long × 12⅝ in. thick, fore top 40 ft long × 8½ in. thick, fore top-gallant 25 ft long × 5 in. thick, fore royal 20 ft long × 4¼ in. thick; main 63 ft long × 1 ft 2½ in. thick, main top 45 ft 6 in. long × 9½ in. thick, main top-gallant 28 ft 4 in. long × 5¾ in. thick, main royal 22 ft 9 in. long × 4¾ in. thick; mizen cross-jack 40 ft long × 8½ in. thick, mizen top 31 ft long × 6¼ in. thick, mizen top-gallant 19 ft 6 in. long × 4 in. thick, mizen royal 15 ft 6 in. long × 3⅛ in. thick, gaff 28 ft long × 8 in. thick, driver boom 45 ft 6 in. long × 8½ in. thick; spritsail yard 40 ft long × 8½ in. thick, spritsail top 25 ft long × 5 in. thick (Fig. 69 gaff and driver boom).

Studding sail booms were round in section, the first third of their length being parallel of the given size, from thence they tapered to two-thirds at the end. The lower studding booms are hinged from the fore part of the channels and there is a rest on the after part to take the weight when the boom is swung in. I give a figure of what they looked like and a simpler suggestion (Fig. 70). The upper booms are shown with the yards.

Sizes: lower studding booms, both fore and main, 35 ft long × 7 in. thick, fore top 27 ft 6 in. long × 5½ in. thick, fore top-gallant 20 ft long × 4 in. thick; main top 32 ft long × 6⅜ in. thick, main top-gallant 22 ft 6 in. long × 4½ in. thick. I have not included the studding sail yards as these would only appear with the sails.

The yards should be blackened and the usual way is to give a couple of coats of leather dye, well rubbed in, followed (when properly dry) with a rub of black boot polish.

The jack staff fits into the groove which is cut into the cap of the bowsprit. It is 13 ft long and 3¼ in. thick, and it is capped by a small truck. Hold it in position by a coupled of metal bands fastened to the bowsprit cap.

● *To be continued*

MODEL OF BRITAIN'S LATEST TANKER

AT a recent informal ceremony at the Science Museum, South Kensington, a model of the 38,000 d.w.t. tanker s.t.s. *Zenatia* was presented to the museum by Mr A. S. C. Hulton, managing director of Shell Tankers Limited.

The model, made from the actual builder's drawings by Messrs Bassett-Lowke, is to the scale of $\frac{3}{16}$ in. to 1 ft and measures nearly 11 ft.

The *Zenatia*, shortly to be completed by Cammell Laird, and her sister ship *Zaphon* which was built by Swan, Hunter and Wigham, Richardson Limited, are the latest additions to the Shell fleet. They have been specially designed to navigate the Suez Canal fully loaded and they will be the largest tankers sailing under the Red Ensign.

Each of these ships, which cost over £2¼ million, is capable of carrying 9½ million gallons of crude oil at a service speed of 16½ knots.

EXPERT'S WORKSHOP

A lathe filing attachment . . . by Duplex

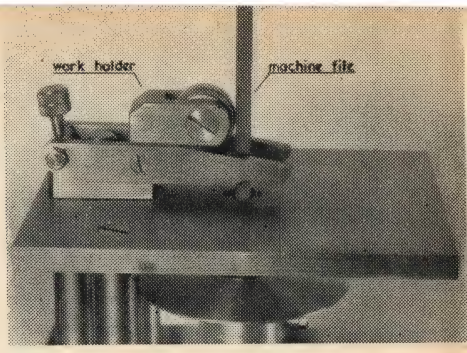


Fig. 31: *The work holder and file roller fitted to the machine*

WHEN a trial run is made by bolting the attachment to the lathe cross-slide and arranging a drive from a V-pulley mounted in the self-centring chuck, the machine should run almost noiselessly and be free from vibration. Where the reciprocating parts have not been sufficiently lightened and vibration is set up, the driving speed will have to be reduced until satisfactory running is obtained.

If all is found to be in order, the machine is made operational by fitting a file selected from those illustrated in Fig. 29. The pillar file and the round file shown in Fig. 30 will be sufficient for carrying out most workshop jobs. It was found, however, that the shanks of these machine files were not always uniform in diameter or truly circular throughout their length. As the shanks of the files are hardened they cannot readily be machined or filed and, where necessary, a correction is best made by lapping the shank with a $\frac{1}{4}$ in. lap (charged with coarse-grain carborundum abrasive) until it fits closely in the bore machined in the upper end of the file spindle.

The files listed are obtainable in three different cuts: 00, 0 and 2; but the medium grade 0 will be found suitable for most purposes. Before putting the file into use see that the blade is truly in line with the shank.

THE WORK HOLDER—T

The main purpose of the fitting is to maintain the work in contact with the work table and keep it from being lifted on the upward idle stroke of the file. At the same time the roller fitted to the forked end of the body takes the thrust exerted by the work and so relieves the spindle bearings of much of the strain that would otherwise result from the leverage applied to the file.

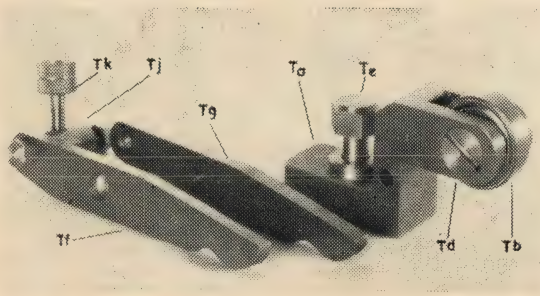
The body, *Ta*, is made from $1\frac{1}{2}$ in. $\times \frac{1}{2}$ in. mild steel, which is marked out as in Fig. 33, and the forked end is machined before the part is cut off to length. Then, after the end of the body has been cut to shape with the hacksaw, the work is gripped in a machine vice secured to the lathe cross-slide and is set with the pivot screw centre at lathe centre height.

Although the roller slot can quite well be formed with the hacksaw and file, an accurate result is more easily obtained by using a side-and-face milling cutter secured to an arbor and mounted between the lathe centres. Some workers prefer to employ an end-mill for machining slots of this kind, but the surface finish is then likely to be somewhat irregular and the advantage of supporting the cutter with the tailstock centre is lost. It is important to mount the $\frac{1}{4}$ in. bore ball-bearing correctly to ensure satisfactory working and freedom from wear. The inner race is securely gripped and prevented from turning, and the outer race is left free to revolve.

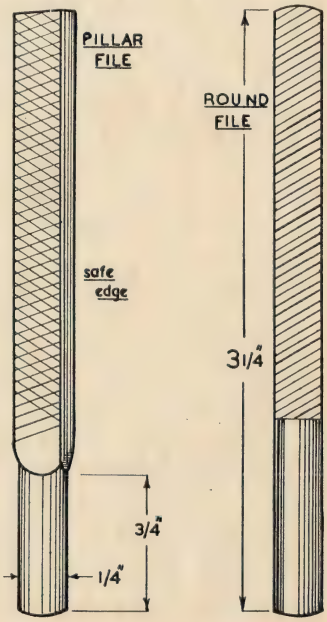
The mild-steel bush, *Tc*, after being machined to an interference fit, is pressed into place in the inner ball race; in addition, the length of the bush is adjusted to make the part a close fit in the forked end of the body, so that when the pivot screw, *Td*, is tightened the bush becomes securely held. (This screw is put in from the near side of the body so that on the working stroke, when pressure on the roller is greatest, the pivot screw tends to tighten.)

The body can now be cut off to length to enable the part to be hacksawed and filed to the finished shape, after which the hole for the 6 B.A. pivot screw, *Th*, is drilled. The body foot is drilled and slotted to admit the fixing screw, *Te*, and also to allow some adjustment of the position of the pressure roller in relation to the file. If the slot is marked out it can readily be filed to shape after a clearing-size hole has been drilled, but an end-mill will do the work quickly and accurately.

After the ball-bearing roller has been fitted in place the part is rested on the work table of the machine, with the roller in contact with the file, so that the hole centre for the



Left, Fig. 32: *The parts of the attachment. Ta, the body; Tb, the ball-bearing file roller; Td, the roller pivot screw; Te, the fixing screw; Tf and Tg, the pressure plates; Tj, the trunnion bar; Tk, the adjusting screw*



Right, Fig. 30: *Dimensions of the files*

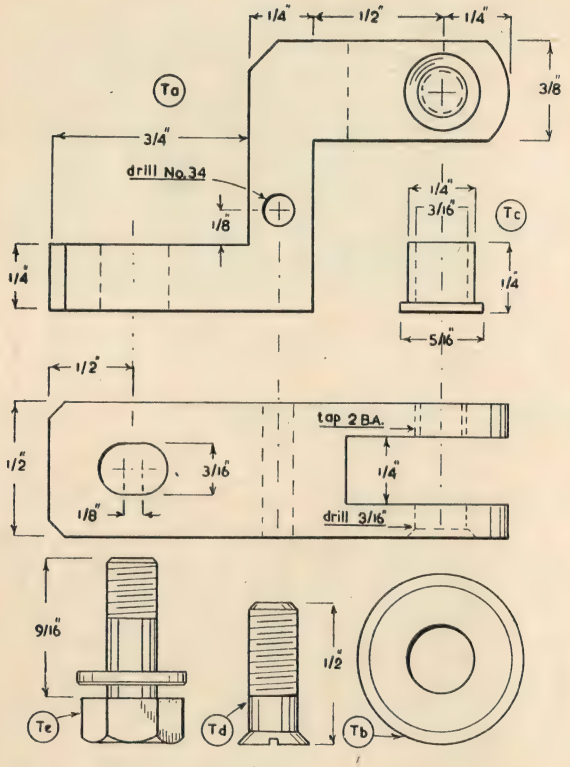


Fig. 33: *The body components with the ball-bearing bush, Tc*

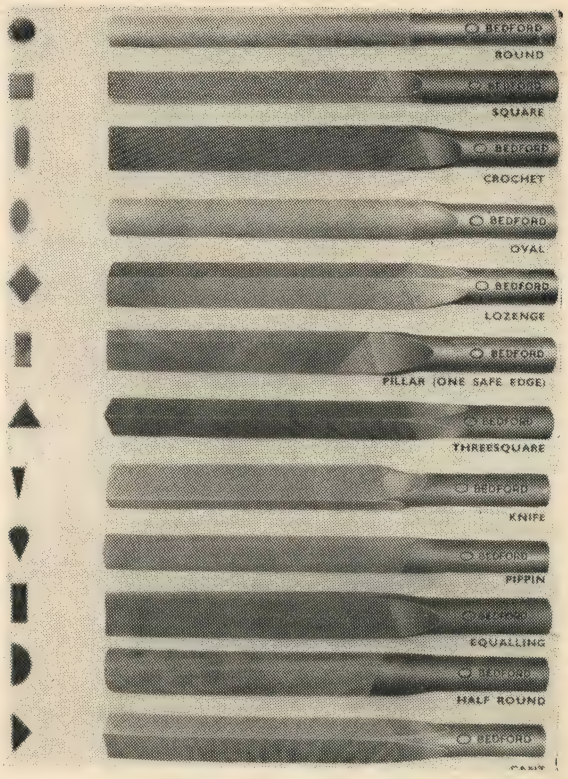
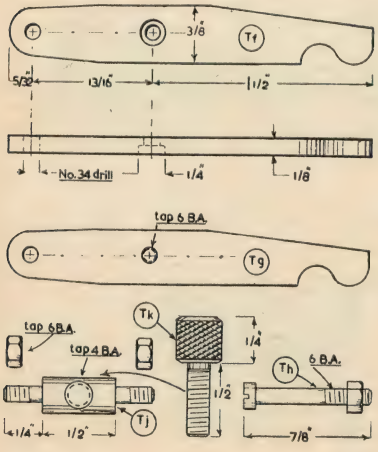


Fig. 29: *Various patterns of commercial machine files*

fixing screw, *Te*, can be marked out on the surface of the table. When locating the screw centre and marking out the dimensions of the slot in the base, the difference in size of the various machine files used must be taken into account.

Fig. 34: *The two pressure plates and fittings*



THE PRESSURE PLATES

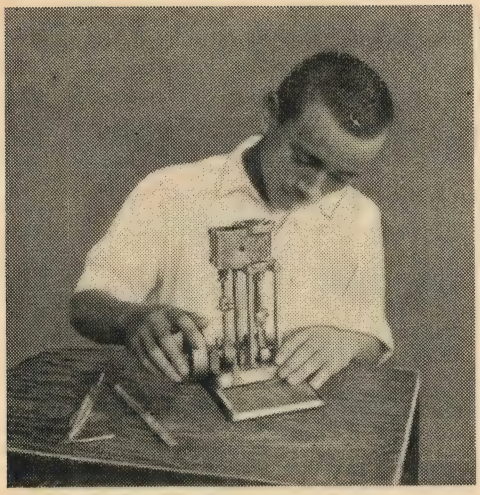
To prevent the work from rising when the machine is in operation the two pressure plates or fingers, *Tf* and *Tg*, are pivoted by the 6 B.A. screw, *Th*, on the body of the attachment, so that to bring them into contact with the work their position can be adjusted by means of the knurled finger-screw, *Tk*.

The plates are cut to shape from $\frac{3}{8}$ in. × $\frac{1}{8}$ in. mild-steel strip; one is drilled and counterbored to provide clearance for the 6 B.A. pivot screw and the other is tapped 6 B.A. To ensure accurate spacing the two plates should be held together with toolmaker's clamps when drilling the pivot screw holes and those for the trunnion fitting, *Tj*. The latter part is most easily made by cross-drilling a length of $\frac{1}{4}$ in. dia. mild-steel rod, when held in a suitable drilling jig, and then tapping it 4 B.A. for the knurled pressure-adjusting screw. With the rod centred in the four-jaw chuck, the two ends are in turn shouldered down and threaded 6 B.A. from the tailstock, leaving a central portion, $\frac{1}{2}$ in. in length, of the full diameter.

When assembling the pressure plates on the body—with the trunnion mounted in place—the pivot screw is adjusted to give working clearance and afterwards is secured with its locknut. While the tips of the two pressure fingers are held in contact with the work table, the two trunnion nuts are firmly tightened so as to secure the work holder in correct adjustment. When the machine is in operation, the roller is adjusted to make light contact only with the face of the file, and at the same time the knurled finger-nut is turned downwards until the work is lightly pressed on, but is left free to slide during the filing operation.

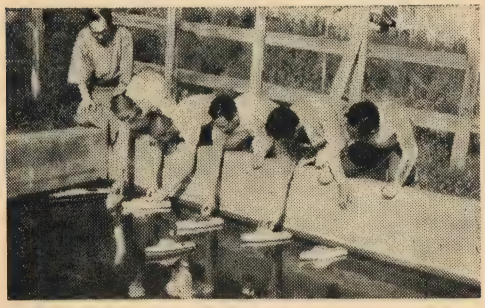
While the machine is under test the oil lubricating the file spindle should be examined from time to time, for any blackening of the oil will necessitate dismantling the working parts so that they can be cleaned with paraffin to remove any abrasive remaining from the lapping operation. If further trouble is experienced it may be that the bearings have not been properly fitted. This will result in metallic contact between the bearing surfaces, which, in turn, may lead to scoring and irregular wear of the journals.

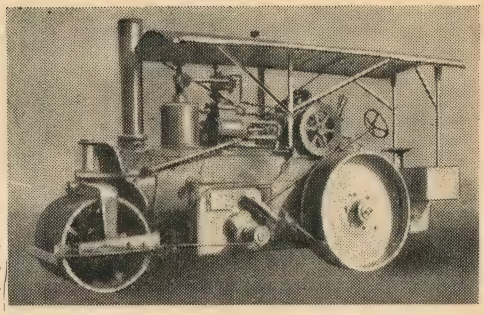
● *To be continued*



Left: The double-size TROJAN *engine made by a student*

Below: Mr Kusano, left, with other hospital patients, amusing themselves with model power boats they built





Above: An interesting steam road roller seen at Taira

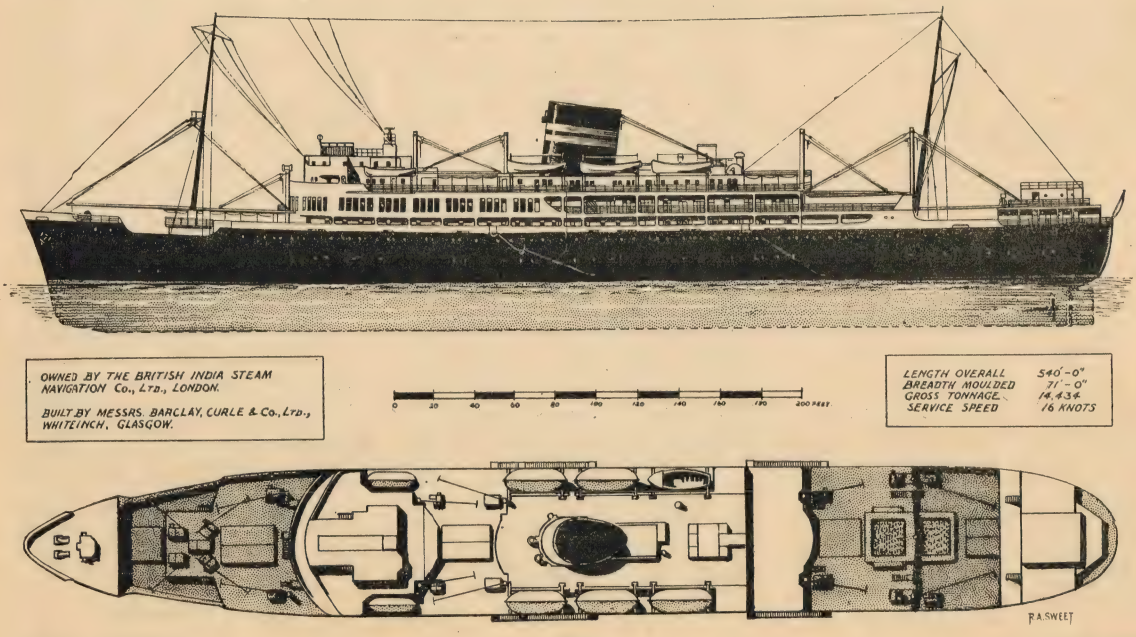
Model engineers from Japan

By R. Kusano

THE double-size *Trojan* was recently completed by one of my pupils, Saitō by name, at our school machine shop. It was first planned to be installed in a model tug which is to pull a small boat belonging to the glee club of our school, of which I am the adviser, during the last summer vacation. Owing to a recent illness this could not be done, but I intend to carry out the idea, together with the construction of *Maisie*, when I am restored to health. ▣

Ship Shapes

PASSENGER AND CARGO LINER "KENYA"


OWNED BY THE BRITISH INDIA STEAM NAVIGATION Co., Ltd., LONDON.
BUILT BY MESSRS. BARCLAY, CURLE & Co., Ltd., WHITEINCH, GLASGOW.
0 20 40 60 80 100 120 140 160 180 200 FEET
LENGTH OVERALL 540'-0"
BREADTH MOULDED 71'-0"
GROSS TONNAGE 14,434
SERVICE SPEED 16 KNOTS
R.A.SWEET

Do not forget the query coupon on the last page of this issue

READERS' QUERIES

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20, Noel Street, London, W.1.

Boiling point and pressure

I would like to know the relationship between water boiling point and steam pressure. I am particularly interested in the boiling point at around 1,000 p.s.i. I have searched all the local libraries in this quest for information—but to no avail.—H.J.S., Heston, Middx.

▲ *It is fairly easy to obtain tables dealing with the boiling point of water at various pressures in the lower range, but very few reference books deal with the higher pressures. However, the graph reproduced deals with temperatures at pressures from* 200-2,000 *p.s.i.*

Straightening frames

I have started to build a 3½ in. gauge *Netta*, the frame steel for which was reasonably true apart from a slight "set" at one end. After riveting on the hornblocks, however, this has twisted the frames out of shape. Therefore, could you advise me of the best method for straightening this ⅜ in. steel, bearing in mind limited workshop facilities?—B.W.H., Norwich.

▲ *The method of straightening the frames must depend upon just where the twist has taken place. Would it be possible for you to insert a plate stay between the two frames at some point, which would ensure that they are the correct distance apart and, of course, perfectly vertical? Alternatively, the only other method which seems possible is for you to lay the distorted part on some perfectly flat surface and hammer the twisted frame, using a hardwood mallet, until the plate is once more flat. If the ⅛ in. steel plate you have used is not too hard it should yield to this treatment.*

For Virginia

Can an oxy-acetylene torch be used to braze and silver solder *Virginia's* boiler? If so, is it necessary to use coke in the braze pan—and can charcoal be used in place of coke?

Is the Davi-Jet gas blowtorch large enough and suitable to do the brazing and silver soldering for *Virginia's* boiler?

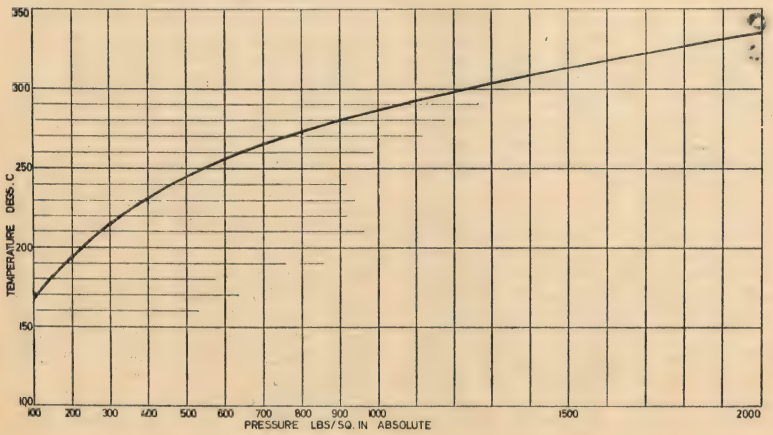
Is a blowlamp the same as what we in the United States call a gasoline blowtorch?—A.D.S., Cleveland Heights, Ohio.

▲ *An oxy-acetylene torch is quite suitable for brazing and silver soldering small locomotive boilers. It is always desirable to pre-heat boilers all over to avoid excessive warping during brazing operations and in order to conserve the heat as much as possible, charcoal, coke or asbestos should be packed all round the boiler during brazing operations.*

A Davi-Jet gas blowtorch would not be sufficiently powerful for brazing the boiler of a 3½ in. gauge locomotive.

A blowlamp is the same as a gasoline or kerosene blowtorch.

The graph showing the relationship between water boiling temperature and pressure. See first query



Extra strong magnets

I am trying to find a firm which makes extra strong magnets in small rod form. I would require them in cylindrical form $\frac{3}{16}$ in. or ¼ in. dia. × about ¾ in. long. The exact dimensions are not important.—A.H., Dublin.

▲ *The Eclipse magnets manufactured by James Neill and Co. Ltd, Composite Steel Works, Napier Street, Sheffield* 1, *are made of high-efficiency magnet steel and should be suitable for your purpose. They are made in a variety of shapes and sizes and this firm, particularly, should be able to supply cylindrical magnets about* $\frac{3}{16}$ *in. or* ¼ *in. dia. ×* ¾ *in. long.*

Other magnet manufacturers include: Marrison and Catherall Ltd, Forncett Street, Sheffield 1.

Swift Levick and Sons Ltd, Clarence Steel Works, Levenson Street, Sheffield 4.

Murex Ltd (sintered magnets), Rainham, Essex.

Compression springs

Could you tell me, please, how to make small compression springs of about 20 s.w.g.?—S.R.C., Redruth, Cornwall.

▲ *These can be wound fairly satisfactorily in the lathe and if you wish to obtain definite spacing between the coils it is possible to use the screw-cutting gear of the lathe to traverse the wire so as to produce the correct pitch. It will be necessary to put a certain amount of tension on the wire as it is wound on the coil, and this can be done by drawing it between two spring-loaded plates held in the lathe toolpost. The amount of tension applied to the wire while it is being wound will have quite a decided influence on its strength.*

The material generally employed for small springs is piano wire—which can usually be obtained from engineers' supply stores or tool dealers, though phosphor bronze and hard-brass springs are used in some cases, especially where avoidance of corrosion is important.

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

QUESTION OF RESEARCH

SIR,—May I endorse Mr Kyrle W. Willans' opinion on small power steam-engine design.

It is a great pity that modern designers do not take the trouble to find out what has already been done and to start where the earlier designers left off, rather than attempt to go all over the old ground.

The White engine gave an incredible i.h.p./steam-consumption ratio, actually as low as 12 lb. of steam per i.h.p. hr. on test under good conditions of steam pressure, superheat and loading. The last design of the White engine was a compound double-acting with piston valves to both cylinders driven by Joy's gear. This gear does give a good steam distribution and has, in small engines, none of the disadvantages as when applied to larger units.

My 22 ft 6 in. launch, recently described in MODEL ENGINEER, has a Savery compound and this is very similar in design to the last White design, having piston valves, Joy's gear, etc. This engine has a consumption of 17 lb. of steam per i.h.p. hr., with a pressure of 250 lb. and only moderate superheat, and this compares very well with the White, where a higher steam pressure and superheat was used.

It is possible that some improvement could be obtained by using cam-operated poppet or piston valves for both inlet and exhaust valves.

Regarding Mr Willans' last paragraph, I see no reason why this should not be possible and I believe that a 10-15 h.p. marine steam plant could be designed for building in the average small workshop.

A small water capacity water-tube boiler is not really such a formidable task, but for marine use do lay off complicated systems involving the use of complex control devices; these may be practical on a steam car but they are neither necessary nor desirable on a boat where there is a constant steam demand, and reliability and simplicity come second place to weight and space saving.

Shaldon, S. Devon. C. HANSONS.

The STAR OF INDIA, *now a maritime museum, berthed at San Diego, California. The top halves of the masts have been off but there is every hope they will be replaced in the near future*

HALF AND HALF

SIR,—Re-reading *The Lost World* by Conan Doyle I was reminded of the following poem, which struck me as applicable to MODEL ENGINEER.

I have wrought my simple plan
If I give one hour of joy
To the boy who's half a man,
Or the man who's half a boy.

Twickenham, Middx. L. ROE.

OSCILLATING ENGINES

SIR,—I should like to endorse Mr Westbury's remarks regarding oscillating engines. As he says, "As an exercise in steam-engine building it leads precisely nowhere," it has none of the interesting refinements of slide-valve gear, with all its absorbing possibilities for experiment with lap-lead, cut-off, etc.

But it does have its own special problems, and its apparent simplicity is a pitfall for the unwary. I know, I fell for the lot ! The steam admission and exhaust ports must be positioned to a fairly high degree of accuracy.

If the piston rod is made too long, the maximum angularity of the cylinder is very small, bringing the ports so close together that their size is restricted and the steam "jumps" across the portblock without doing any useful work in the cylinder.

Thank you, Mr Westbury, for showing me the light !

One other point; the recent petrol shortage has focused attention on electric vehicles. During a lifetime in the milk trade I have driven all types and sizes of these, and I think they are most interesting machines. I am sure many readers would welcome an authoritative article on them, especially the early electric Broughams and electrically powered cars.

Welwyn Garden City, Herts. R. KNEE.

MACHINING ALLOWANCE

SIR,—Some time ago we purchased a complete set of 5 in. gauge locomotive castings from one of your principal advertisers. The finish of these castings, particularly the wheel spokes, excited much favourable eomment from our knowledgeable engineers.

However, when we checked the dimensions of the castings against the drawings, the small amount of machining allowance caused us some concern. Extreme care was taken in setting up the wheels for machining; four machined perfectly, but two would not clean up on the rim flanges.

In accordance with the instructions in the catalogue, the two faulty wheels were returned to the firm. One was replaced without charge but the other was returned with a letter to the effect that we were too particular and if we expected perfect results we should buy extra castings !

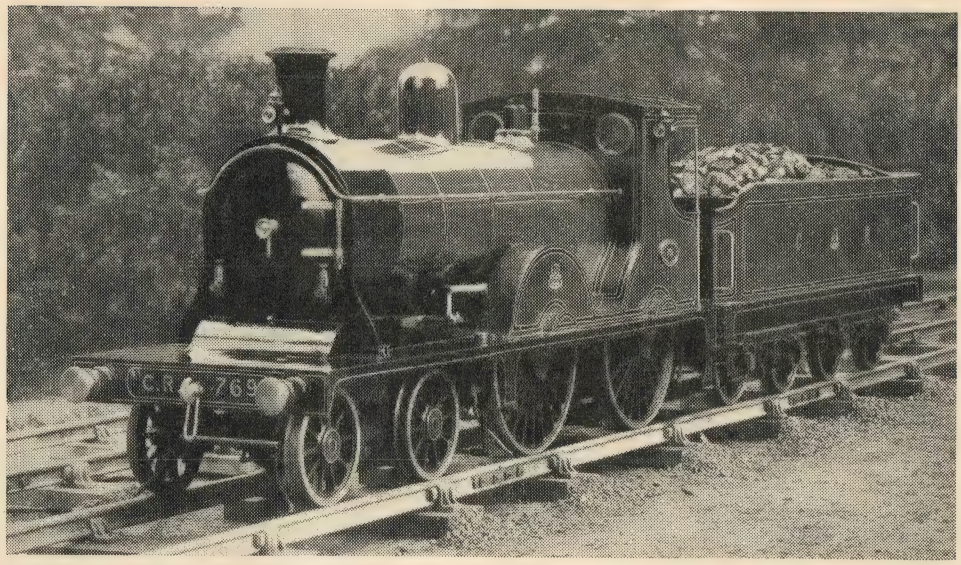
We have since machined the cylinders and after putting in a great deal of precision work, we find that the vital portface on one, will not clean up.

On some of the other castings, we are thinking of building up undersize surfaces with Sif-bronze applied with oxy-acetylene flame.

It seems unbelievable that a firm should put in such a lot of care in the preparation of patterns and castings and yet render most of them useless by skimping the machining allowance to 1/32 in. or less.

This is certainly not enough to allow a cut under the abrasive skin and there is no margin for core shifts, local shrinkage depressions or slag inclusions.

I should be glad to know of the experience of other model engineers



The 11¼ in. gauge model of Caledonian Railway's No 769, which has figured in readers' letters recently. The present whereabouts of this locomotive remain a big mystery

and I hope that your advertisers will comment on this matter.

R.R.E. College of Electronics,
Malvern, Worcs. JOHN GRAY.

POWER BOATS

SIR,—With regard to recent letters on variety at power boat regattas, I have, unfortunately, owing to other commitments, been out of the running of power boats during recent years, but I have attended a fair number of regattas during that period and I have also been struck by the lack of variety in events.

Why must the steering event be always run on the straight, why not start and finish on the same side of the lake, running the boat in a big curve as diagram? To my mind much more skill is required to hit a target this way than on the straight.

Of course, it would knock out the fixed rudder enthusiast, but what boat goes to sea with a fixed rudder; in any case I think fixed rudder boats should be barred from steering events.

I do not think the stopping of the boats would cause any difficulty provided a fair number of stoppers were in the water. Of course, radio control would be barred from such an event.

Charlton,
London, S.E.7. P. V. PREECE.

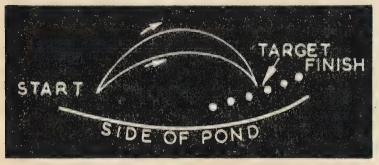


Diagram illustrating Mr Preece's idea for a curved regatta course

SINGLEWHEELERS

SIR,—I was very interested in J. N. Maskelyne's drawings and article on the Midland Railway Johnson Singles [MODEL ENGINEER, April 4]. They were the only single drivers I ever saw at work.

I live near the old Midland line and I was a schoolboy when the last of them were running; in fact I was at the Leicester Station one day and saw one standing there long after I thought they had all gone.

However, I think Mr Maskelyne is wrong when he says that the M.R. engines and C.R. No 123 were the only singlewheelers to run after the grouping.

Both my father, who is a retired Great Central engine driver, and I are certain that at least one of the G.C.R. Pollitt 4-2-2 class ran until 1926 and the North Eastern 2-2-4 tank *Aerolite* ran even longer. Both, of course, on the L.N.E.R.

My father and I built a 2½ in. gauge Pollitt single about 16 years ago. It was described by L.B.S.C.

Regarding the article by Ernest F. Carter on the 18 in. gauge locomotive at Crewe works—*Tiny* and *Dickie*—can he say if they are still in existence? They almost certainly were just before the war when they were reported to be in the paint shop at Crewe works, as also were L.N.W.R. 2-2-2 *Cornwall* and 2-4-0 *Hardwick*.

The guide who was taking us round the works said the tiny engines had been used round the works many years ago. He did tell us at the time who had built them, but as it was about 20 years ago I cannot remember now what he said.

Leicester. R. TAYLOR.

HOT-AIR ENGINES

SIR,—With reference to Mr S. McGregor's letter on hot-air engines [Postbag, April 11] I cannot agree that there is a lack of interest on the part of your readers on this subject.

Last January I wrote to MODEL ENGINEER suggesting that the many articles which have appeared from time to time on hot-air engines might well be published by you in handbook form, and I am still hoping that this may be done. I agree with Mr McGregor that if Mr Westbury has the time to give his attention to this matter it would certainly stimulate the interest which model engineers have in this subject.

In the latter part of his letter, Mr McGregor is evidently referring to the excellent article by R. F. M. Woodforde on an "Easily Made Hot-Air Engine" published in the January 24 issue. I built this engine to Mr Woodforde's specification, and it runs exceedingly well at approximately 600 r.p.m.

In his concluding paragraph Mr McGregor suggests that the hot air should not be passed through the cooling end of the displacer cylinder before acting on the power piston. In this I think he is wrong, for the reason that this is part of the regenerative principle of the Stirling engine operating on Carnot's cycle, the theory of which is fully described in Prof. Ewing's book *Heat Engines*.

What does astonish me is that the air can go through Carnot's cycle of isothermal and adiabatic expansion and contraction at a rate of 10 times per second, as it does in my little engine when running at 600 r.p.m.

Hayes, Kent. B. BINYON.

MUNCASTER MODELS . . . continued from page 636

The steam chest arrangement of this engine is very ingenious in design, as it allows of a single chest for both h.p. and l.p. cylinders—rather unusual in compound engines—thus eliminating the need for an eduction pipe which, as already pointed out, may be a source of heat wastage, especially as it often extends the full length of the cylinder block. This improvement is effected by using an inside-admission piston valve for the h.p. cylinder and a flat slide valve for the l.p. cylinder.

Entry to the piston-valve housing is by way of a port in the side of the cylinder casting between the " lands " of the valve and exhaust escapes at the ends of the valve, directly into the main steam chest space, whence it is admitted to the l.p. cylinder under the control of the flat slide valve. It is finally exhausted by way of the cavity in this valve, in the normal manner.

Details of the piston valve and the ported half-liners are similar to those of the single-cylinder vertical engine, (Fig. 26 in the April 18 issue). Some constructors may prefer to fit a single continuous liner for the full length of the housing, which will serve exactly the same purpose—and it is not necessary to chamber out the centre larger than the working diameter, though this is usually done in large engines to avoid the formation of ridges in the bore of the liner.

Fig. 32 shows three views of the cylinder block, namely side elevation, sectional plan and underside plan. The former shows the position of the exhaust and steam admission ports at the front and back of the engine respectively; each of these has an oval flange joint face. In the sectional plan, it will be observed that the steam admission port goes directly into the piston valve housing while the exhaust port communicates with the centre port of the l.p. cylinder port face.

The underside view clearly shows the shape of the lower steam chest cover and the method of attachment by six studs and nuts, as well as the position of the valve rod guide bracket, which is presumably cast on the cover, though this is not as clear as it might be; the sectional elevation (Fig. 31) shows it rather differently, and the top view in Fig. 32 omits it altogether.

In view of the difficulty of aligning the guides with the glands, which in the case of the h.p. valve also have to be exactly concentric with the housing, I should favour making two separate guide brackets and bolting them in place on the cover after lining up. Valve rod guides are not considered essential on many model steam-engines, particularly where the rod has a tail end guide, as very little side thrust is encountered but they are almost universally fitted on large engines.

The rear view of the engine (Fig. 33) shows a belt-driven governor which regulates the speed by means of a throttle valve of the axial piston type. Further details of these items will be given later. The cast columns, together with details of the guide surfaces and crosshead, are as for the engine shown in Fig. 26. There is plenty of room in the centre of this engine for fitting double eccentrics if desired, and either one or two intermediate main bearings may be fitted.

● *To be continued*

Routemaster buses to have Leyland units

THE mechanical equipment in two new prototype vehicles for London Transport has been produced by Leyland Motors for trial by L.T.E. engineers.

One, a double-decker for the Green Line coach services, will be tested in a few weeks' time on route 721 from Brentwood to Aldgate. It is said to be the last word in double-deck passenger comfort. The other will operate as a bus on a central area service, route 85, Putney Bridge to Kingston.

The vehicles are Leyland versions of the new Routemaster, the bus of the future evolved by London Transport's road vehicle engineers, led by Mr A. A. M. Durrant, C.B.E., chief mechanical engineer for the Road Services.

Designated RM3 and RM4, the two new models incorporate the Leyland 125 h.p. diesel engine, a type already fitted to over 2,000 Leyland buses in service in London.

Designed as a double-decker coach for the Green Line routes, RM4 is equipped with fully-automatic gear change equipment, the gears sorting themselves out automatically and changing up or down according to the speed and load on the bus. If he desires, the driver can over-ride the automatic mechanism and select gears merely by moving a miniature lever.

Folding doors are provided around the rear platform and seat spacing is the same as for other Green Line coaches. Consequently it seats only 57 people—as compared with 64 for RM3—but still one more than the present RT buses.

Although all running units, such as engines, axles and springing, have been manufactured by Leyland to their own detailed design, they conform to the overall design laid down by London Transport. One feature which they will have in common with other RM models is special heating for upper and lower saloons.

A CHILDREN'S LOCOMOTIVE . . .

continued from page 646

BOILER

The outer casing of the boiler can be made from 22-gauge sheet, any metal except aluminium will do. A 9½ in. length of 2½ in. stovepiping, or a tin canister of same dimensions, will be quite O.K. Just slit one end down for 3½ in. length, make a cross-cut at the end of the slit and open it out to the shape shown in the cross-section. Fit a throatplate of the same kind of material, like that shown for the larger *Virginia* boiler, and fix it with three or four rivets at each side. No brazing is needed on the casing.

The backhead is flanged up from 16-gauge sheet copper and a 7¾ in. length of 1¼ in. × 22-gauge copper tube is silver soldered to it. Don't use anything thicker; if this thin tube isn't available, roll up a bit of 22-gauge sheet copper to the given diameter, allow ¼ in. overlap, put a few 1/16 in. rivets in to hold the edges in close contact and silver solder the joint. The front end is closed by a flanged disc of 16-gauge copper silver soldered in. Two 5/32 in. water-tubes can also be silver soldered in as shown, but they are not absolutely essential on an engine of this kind.

The front end of the casing is furnished with a smokebox front carrying a dummy door and adornments. This may be a casting, or it can be built up by cutting a 16-gauge plate to the shape of the smokebox front (drawing next week if all's well) and silver soldering a flange to it. This should be a tight push fit in the end of the casing, but is not fixed as it is removed while getting up steam. The chimney liner is a 1 in. length of 9/16 in. thin tube silver soldered into a hole drilled ⅞ in. from the end of the casing.

● *To be continued*

A ship modeller's diary

By JASON

DURING the last days of March the news about progress on the preparation of the clipper ship *Cutty Sark* for her opening to the public was not so good. The work on her stopped by reason of the shipbuilding strike.

This may, of course, affect the official opening by the Queen in the middle of May. It may also affect the visit to this famous ship by the Thames Shiplovers and Ship Model Society which is fixed for 2.30 p.m. on Saturday, May 18, prior to the official opening *but*, thank goodness, even as I write the strikes are called off.

However, in the published reports it was stated that shipyard workers would not stop work on the *Mayflower* down at Brixham, whereas the shipyard workers on the *Cutty Sark* were instructed to stop work. All shiplovers will undoubtedly wonder why such a distinction should exist between two famous ships.

Neither are engaged in profit making. The *Mayflower* has to cross the Atlantic in order to tie up with a vast American programme in celebration of the anniversary of the landing of the Pilgrim Fathers. It would be fair to say that the *Cutty Sark* is essentially British whereas the *Mayflower* is almost completely American.

The cradle of our sailing ships

IN no less than four separate parts of the country public-spirited people are endeavouring to preserve the old sailing craft of our country. These are (*a*) the Thames Barge, (*b*) the Norfolk Wherry, (*c*) the Severn Trow and (*d*) the Humber Keel.

The Severn Trow and the Humber Keel may be unknown to most people so here are a few notes about the latter.

The Humber Keel Trust was formed five years ago and purchased the keel *Mayday*. Just now the Trust are striving to rig her up as it is believed that once rigged and back at work the keel would be almost self-supporting.

The vessel has carried a number of cargoes to various parts of Yorkshire and Lincolnshire, using the Humber and its tributaries. No doubt the question arises in one's mind: What does a keel look like?

It is a heavily-built cargo-carrying vessel, much akin to the Thames Barge in hull appearance but different in rig. The mast is stepped amidships and sets a square mainsail with several reef-bands. There is also a square topsail. This rig is very similar to that of the Severn Trow.

Obviously, the trow and the keel are not so handy as the wherry and the barge for the two latter are fore-and-aft rigged and, also, they carry a greater spread of canvas. All four are handled with small crews of two or three hands.

Models of the trow and keel have been seen at the Model Engineer Exhibition during recent years. If you feel like helping here is the name and address of the chairman of the Humber Keel Trust: Kenneth W. Grimes, 1 Westfield Avenue, Molescroft, Beverley, E. Yorks.

Raising the anchor

A NORTH LONDON reader raises a query about the windlass on *Cutty Sark*. He takes strong exception to the inclusion of "that horrible pump handle arrangement" on a number of models of this famous clipper. Moreover, he cites in evidence an appendix in Dr Longridge's own book (p. 208): "Specification, Clause No 30, windlass. To be Emerson and Walker or Harfields patent as purchaser may decide on; owner to pay the difference of price from a common windlass."

Commodore Sir Roy Gill (commanding *Cutty Sark*) in the absence of evidence would not comment on this development. However, I have sent the letter to Mr Carr who is, I know, a stickler for correctness in all things appertaining to the ship.

What did the Emerson and Walker patent windlass look like? The answer will be found in the Patent Office, Chancery Lane. According to Dr Longridge he found a big gear-wheel and drum when he examined the *Cutty Sark*. He thought this could not have been an original fitting, so introduced the "pump handle arrangement"; hence the present headache for all concerned.

Mr Field of Birmingham made a thorough examination of the ship in Falmouth. There are those who sailed in her in her heyday. What do these people say? Maybe, too, Mr Carr has not been without knowledge of this fitting. He may throw some light on this.

At this late stage little can be done in alteration to agreed plans. The most that could be hoped for in time would be a dummy windlass (if plans and sketches are available), but there is always the question of cost.

Merseyside

I HOPE to report a visit to the Liverpool Nautical Research Society in my next notes, for it was on Merseyside that I founded the first of the ship model societies closely followed by my launching of Manchester, Glasgow and Hull societies. That was more than a quarter of a century ago.

Ship Model Society No 1 lasted a few years but Glasgow has gone on from strength to strength. For some years there were two societies on Clydeside and in the opinion of many they possessed several of the finest modellers in the country. The name of Peach is almost a legend down South among the Sassenachs. John Bowen, another product of the Clydeside clubs, won the Championship Cup in the Miniature Class at last year's M.E. Exhibition.

Those who were favoured to see a copy of *In Retrospect* last year will have gathered something of the scope and policy of the Liverpool Nautical Research Society; moreover it numbers among its members some very excellent modellers. It is also the custodian of the cups and trophies accumulated by the pioneer ship model society mainly due to its patron, the late Robert Gladstone. But more about this benefactor to ships, shipping and ship models later.

Annual miniature model competition

HAMMERSMITH Ship Model Society held its annual competition last month. This started originally as a "pep" effort by the alert chairman of the society (*a*) to encourage members to work at models and (*b*) as a safety-valve for members on big and monotonous models.

Over the years it has achieved its purpose. There were some unfinished models and the rule is: at least six models or no competition for the Chairman's Cup. There was plenty of variety, from a Thames Barge to a Chinese Junk, from H.M.S. *Vanguard* to a mid-nineteenth clipper.

The cup was won by Mr Harkness who exhibited a model of Captain Bligh's open boat in which he made his famous voyage. This go-ahead society hopes to have no less than half a dozen exhibitions during 1957.

The chairman, Mr Bill Gay, told me that plans are being formulated for a European get-together of ship modellers, but nothing tangible will happen for two years or so. ▣

CLUB NEWS

EDITED BY THE CLUBMAN

IN response to visitors' requests, Birmingham Society of Model Engineers is reverting to its former practice of holding the National Rally in September. This year's event will take place at Campbell Green on September 7 and September 8.

The increase in the flow of petrol has eased some of the doubts which were troubling some of the clubs when the year opened. Events which were formerly provisional can now be made more definite.

There is plenty doing throughout the summer. I have just been told of a steam festival which **Ashdon, Saffron Walden and District Young Farmers' Club** is holding at Hadstock aerodrome on June 15. The organisers hope that there will be road locomotives, steam-wagons, road rollers, steam cars and "all forms of machinery driven by steam" including possibly fairground engines, an organ, portable and stationary engines—and models. Owners of vintage and veteran cars will be given a special pass and special car park, providing that they arrive in these vehicles.

Everyone interested should write to the festival secretary, Miss Ann Cliff, Sandons Farm, Ashdon, Saffron Walden, Essex. Send a stamped addressed envelope and Miss Cliff will provide details and entry forms.

Andover Traction Rally is being held at Finkley Manor Farm—the same place as last year—on May 11. Gates open at noon and the first event is at 1.30.

Old friends will be there, and with them we shall find at least four engines which are making their first appearance at the rally.

Showmen's engines should be well represented. Rally secretary G. Howell (5 The Crescent, Andover, Hants) tells me that the new owner of the Burrell *Prince of Wales* has transformed it to a condition as near new as possible. "It is a marvellous sight," Mr Howell adds.

The Burrell tractor, *Russell Baby*, which will be present, has been thoroughly repainted and lined. But, of course, there is much else of interest—not forgetting the models. A 7¼ in. Britannia class locomotive will be hauling passengers.

THANK YOU, ROTHERHAM

"As soon as one group of pioneers had created a promising society, they reached out a helping hand to others. . . ."

I wrote this in March, and now I hear of a society whose first desire, now that it has found its feet, is to help other clubs into existence—clubs which may have no direct connection with model engineering.

This society is **Rotherham M.R.C.** It came to birth three years ago through a chance meeting of enthusiasts at a local engineering exhibition. "Progress has been such," writes secretary P. C. Thurlow (Walden, 7 Larch Avenue, Bramley, near Rotherham, Yorks.), "that we are now in a position to hold our own shows, and we feel that we would like to help others in the way we have been helped."

The Rotherham area has many people with interests such as engineering, cars, architecture and the theatre—which might be given focus by a club. As these clubs apparently do not exist in the neighbourhood, Mr Thurlow is inviting all adults who are interested to drop him a line. Rotherham M.R.C., itself formed by the discovery of people with common interests, will then try to bring together persons of like mind.

All readers will commend this admirable gesture. Here is a model club with such breadth of interest and such a strong community sense that its own successful progress in just over three years inspires it to seek out the clubless in other fields—from engineering to the theatre.

Obviously, Rotherham M.R.C. is an organisation of which any town would be proud. Its next exhibition in November deserves the keenest possible support from the public and from model engineers in all parts of Yorkshire. "We shall be happy," says Mr Thurlow, "to allocate space to exhibits, drawing attention to other branches of model engineering."

WEST RIDING'S LOSS

In the bulletin of the **West Riding Small Locomotive Society** W. D. Hollings pays tribute to H. P. Jackson, the society's first president, whose death is deeply regretted.

"Professional as he was," writes Mr Hollings, "he was essentially a modest man, especially about his ability to produce 'class' work, and he repeatedly asserted that in his view one had to look to the amateurs for the production of outstanding model engineering.

"His best-known designs were based on the well-known prototypes of the day, mostly in ⅜ in. scale, and included the G.N. 8 ft single N.E. Class R, L.N.E.R. V.2, and Stanier's *Princess Royal*. At the time of his death he was engaged on a model of the famous N.E.R. 4-2-2s which earned their fame on the 65-minute Leeds-Scarborough expresses."

Many who read these lines will have in their possession a drawing, casting or other example of Mr Jackson's fine professional craftsmanship.

NEW MEMBERS FOR TOPSHAM

One result of the exhibition held by **Topsham M.E.S.** was the enrolment of four new members: Messrs Woolyer, Faggatter, Bowker and Davie.

New work in progress since the exhibition includes a 5 in. gauge *Netta* and a 3½ in. gauge *Canterbury Lamb*, an astronomical telescope big enough to live in, and a 3½ in. gauge freelance 2-6-2T by founder T. Spike.

Mr Spike's model was begun on 18 October 1956, and the chassis was completed and tested on the track with compressed air on November 18. By January 27, the boiler was finished, erected and painted, and the locomotive proved itself a good hauler under steam. The only castings purchased were the wheels and dome.

At the next exhibition Topsham will stage work which is appearing in public for the first time.

M.E. DIARY

May 4.—S.M.E.E. Special rummage sale, 28 Wanless Road, London, 2.30 p.m. Bristol S.M.E.E. Aircraft Structural Testing, J. P. Ashford, Folk House, 7.30 p.m. R.A.C. "The Age of the Motor Car," Tea Centre, London (last day). Otago M.E.S., N.Z. 21st birthday, ladies' night.

May 11.—Andover and District M.E.S., Andover Rally, first event, 1.30 p.m. Eltham and District L.S. Club Day, Avery Hill Road track, Eltham.

May 14.—Bristol S.M.S. "Warships of the Transition Period," J. Young, Legion House, 7 p.m.

May 19.—M.P.B.A. South London regatta. Worcester and District M.E.S. public running day, Waverley Street, Diglis.

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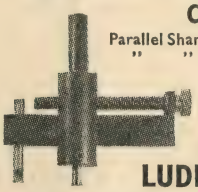

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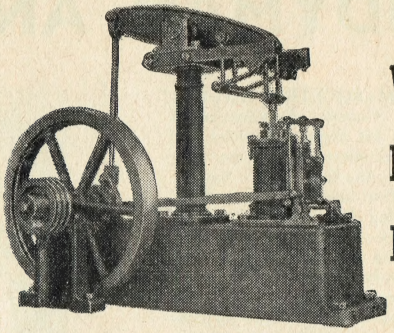

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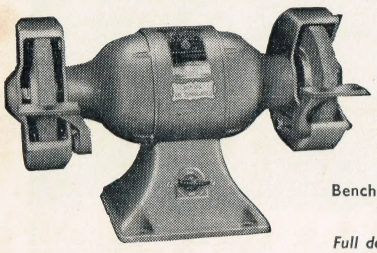

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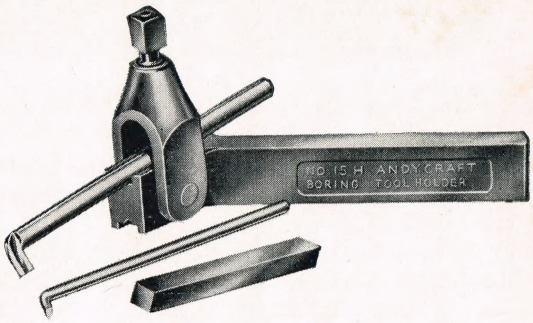

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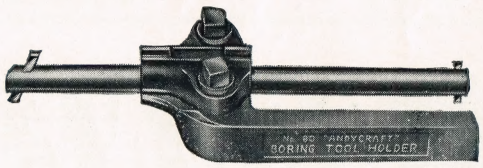

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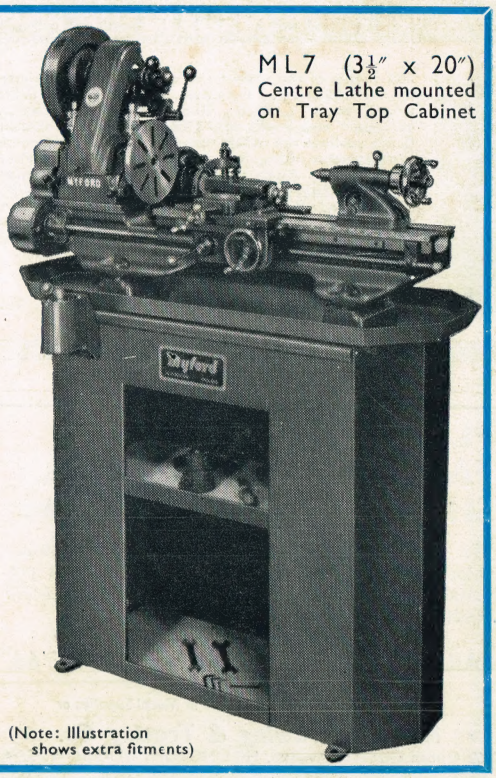

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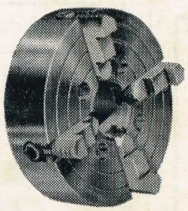

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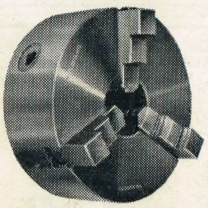

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Micro concentricity system enables accuracy to be adjusted within .0002″ (two tenthousandths)—total indicator reading.

Adjustment feature also permits wear and tear to be "taken up" as this occurs.

Send for free descriptive brochure of this remarkable new "BURNERD" development.